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EDITORIAL NOTES—GAS, &c.

Gas or Ammonia?

THE modern text-book on gas manufacture is familiarizing the student with the fact that a high yield of ammonia is inconsistent with a high gas-making efficiency, especially in plant of the producer type. The investigation on the "Use of Steam in Gas Producer Practice" by Dr. W. A. Bone, F.R.S., and Mr. R. Vernon Wheeler, which formed the subject of a paper read by them at the meeting of the Iron and Steel Institute last week, fully confirms text-book teaching in this respect, as will be seen by reference to the epitome of the contents of the paper which appears elsewhere in this issue of the "JOURNAL." Incidentally also it affords an unexpected but apposite and welcome confirmation of the views expressed a few weeks ago in our editorial columns, as to the fallacy of the idea that a process which aims primarily at the production of ammonia can compete in regard to gas making with processes of which gas is the staple product. We then instanced three distinct manufactures, in all of which coal is carbonized, but with a different end primarily in view in each case. Coke-ovens carbonize coal for the production of coke, but necessarily yielding some gas and some ammonia; Mond "gas"-producers carbonize coal for the production of ammonia, and incidentally make a large quantity of very inferior gas; gas-works' retorts carbonize coal primarily for the production of gas, but yield also some ammonia and coke. The relevance hereto of the research conducted by Dr. Bone and Mr. Wheeler lies in the fact that they have demonstrated by exhaustive practical trials that, when a Mond gas-producer is operated so that it becomes a reasonably efficient gas-making machine, it ceases to yield a relatively large quantity of ammonia. Indeed, under such conditions, ammonia recovery must generally be abandoned as unprofitable. It is a case either of plenty of ammonia and bad gas, or of good gas and little or no ammonia. When we pointed out in the editorial article already quoted that these were alternatives, and that a proper yield of good gas was inconsistent with a large yield of ammonia, we had in mind the prospects of the "Coalite" scheme for the carbonization of coal; but the investigation with which we are now more particularly concerned suggests that it may be appropriate to-day to refer to the prospects of Mond "gas" schemes.

Private owners of Mond producers—such as Messrs. Monks, Hall, and Co., of Warrington, on whose plant the investigation by Dr. Bone and Mr. Wheeler was made—are at liberty to use their producers in such a manner as to get a tolerably high gas-making duty from them. That is to say, they may reduce the proportion of steam in the air-blast to that represented by saturation of the air at 60° Fahr. or thereabouts; and they will get a satisfactory yield of tolerably good fuel gas, but the ammonia produced will represent only 27 per cent. of the nitrogen of the coal. The gas, however, will contain over 27 per cent. of carbonic oxide, or about twice as much as the maximum which the Mond Gas Act imposes on undertakings which supply Mond gas for general consumption. Consequently, the Mond Gas Companies are precluded by statute from working their plant so as to secure a high gas-making efficiency, and so as to produce a tolerably good fuel gas. They are restricted, by the statutory imposition of a maximum proportion of carbonic oxide in the gas supplied, to using their producers primarily as ammonia-making plant, and to making gas which is emphatically condemned by Dr. Bone and Mr. Wheeler on account of its poor value as a fuel. The owners of works in Staffordshire who refuse to avail themselves of the Mond gas which is brought to their doors are accordingly shown to have better judgment than the Directors of the local Mond Gas Company credit them with. It appears that Mond gas-producers cannot be profitably worked solely as ammonia-making machines; and even if they could, the gas produced is too troublesome a bye-product to be readily run to waste. No; a market for the gas is essential to the success of the Mond gas undertakings. But the gas—alas for them!—is so indifferent in quality that it is spurned and rejected by prospective buyers. Committed as they are, by statutory requirements, to the supply of gas of no better quality, the prospect before these undertakings is indeed a sorry one. The owners of private Mond gas-plants may, as already remarked, profit by the results of the investigaton at Warrington, and operate their producers in such a manner that they shall obtain a higher efficiency and a better gas. The gas which under these conditions is comparable in quality and nature with good producer gas, can no longer be properly designated Mond gas, and might equally well have been made in a simpler type of producer and from gas coke instead of bituminous coal.

The value—which is considerable—of the investigation by Dr. Bone and Mr. Wheeler lies mainly in its presentation of a concrete example of the effects of varying the conditions of operating a gas-producer of the Mond type. The theoretical considerations and the effects have been expounded from time to time in the "JOURNAL," and will be found crystallized in text-books dealing with the generation of fuel gas; but there was wanting such a far-reaching and comprehensive illustration of the effect of changing conditions as has now been presented. The labour involved in conducting this research has been extensive; and thanks are due both to the investigators and to the firm who allowed their plant to be used for the purpose and the results to be published. The names of the investigators are alone ample guarantee of the thoroughness and trustworthiness of the research work, even if there were not plenty of internal evidence thereof afforded by the paper itself. In one point only, we think that they might have altered their scheme of work with advantage. We should have preferred the calorific value of the gas to have been determined by means of a calorimeter instead of, as appears to have been the case, by calculation from the results of an analysis. With the analysis made by chemists so competent in this special branch as Dr. Bone and Mr. Wheeler, it is unnecessary, however, to emphasize our preference.

The Handling of Material in Gas-Works.

THE economical transport of material in gas-works is a question that has, with equal steps, grown in importance with the development of the gas-supply industry to the vast extent of to-day. The industry is one that deals with material in large bulks in its manufacturing operations; and the method of handling that material plays a notable part in the final economy of production. This truth has worked its way well into professional philosophy; and the result has been very substantial encouragement to those who are makers of plant designed to inure to economy. Those who have made it their business to provide mechanical means of handling material in gas-works have responded to that encouragement; and, with a keen perception of the necessities, have adroitly brought those means to a state of high technical perfection. Yet the hope lives that progress in this direction has not ended, and that further perfection will be attained. A broad choice of coal and coke handling systems is now offered; and the wide variation in the conditions of application renders this desirable. All the systems have their good points; and there is always one of them that is more appropriate than the others to any one works—always providing that the operations of the works are on a scale that warrants the displacement of hand labour by mechanical plant. The conditions of every works are dissimilar. Levels, available space, location of plant, possible extensions of existing plant, future requirements, amount and weight of work to be performed, the situation of the points of loading and unloading, the circumstances of the loading and unloading, and the question of the time when transport has to be performed, are all fundamental points

that must weigh in the consideration of a scheme and the choice of a system. It is impossible to say, on a mere inspection of a system of material handling, and the arrangement of the several parts of the plant that go to make up the whole, that because that system and arrangement are economical in, and the best for, the one works they will be so in another works. No plant of this kind can have such inherent qualities as to give it universality; and so, in every case, before adoption, there must be full consideration of all the circumstances involved.

A large amount of our space has lately been given up to what we believe are valuable contributions to the literature upon this subject of transport, and which contributions will be of vast assistance to the members of the gas profession in broadening views in considering the bearings of the question upon their own particular conditions. We refer more especially to the contribution on Feb. 12 last of Herr E. Körting, the Chief Engineer at Berlin of the Imperial Continental Gas Association, and of Mr. G. Dieterich, whose series of articles, finished in last week's issue, forms the most complete technical work that has yet been published on the application of aerial transport—rope-driven and electric suspension railways—in gas-works. By now directing attention to these recent publications in our pages, we are not advocating any particular system, but welcome what has appeared as an important extension of the systems offered to large British gas-works, supported with testimonials and examples of application ranking high in order.

If these articles are read with care, many guiding principles will be found; and from the experience so brought together advice can be obtained that will assist in enabling the engineer who is wandering into the application of the mechanical handling of material for the first time to avoid many pitfalls. The foremost reason for adopting mechanical plant is that of economy; and, the second, the assurance of protection, by creating, through the aid of such plant, a certain independence from anxieties caused by ebullitions in the labour world, and which, through political agencies, threaten to have their intervals shortened. The second reason will not concern us in this article. As to economy, one warning of experience is not to be led away by large and successful installations into doing something on a stately scale in a gas-works the operations of which will not allow of an extraordinary capital expenditure in this way. We have seen, among the many installations inspected, instances which can never repay the outlay upon them through the amount of work they have to perform, or are likely to have to perform; and we have seen others that have been constructed with an eye to present purposes only, and planned in such a way as to inhibit their use entirely in connection with any extension of the carbonizing plant on the only available site for the purpose. Economy in those cases cannot in the present or in the future follow an easy course to its full length. This is a point that Mr. Dieterich also makes when he shows that, even the systems of unloading and loading in connection with the mechanical handling of material may make the difference between nullifying the economy of a whole plant and increasing its economy.

Another point is that the choice of a track for conveying plant must be such that it will not act as an impediment to other operations; otherwise there will be a contra-account to any economy accruing direct from the plant, and the choice of track may likewise have a great influence upon the further general development of the works. It is in this connection that the start is to be obtained in the consideration of the question of aërial transport; for in aërial transport we have the minimum of interference with ground operations. Mr. Dieterich carries us through from this stage to the proving, by notable example, the points of adaptability, reliability, and safety, and ends by claiming for suspension railways that they are technically and economically ideal. All professional readers will not be prepared to unpremeditatedly subscribe to this opinion; but that the plants are technically interesting and show great technical spirit and ingenuity, and that their promise is far-reaching, can be testified. Aërial conveying is, of course, old; the design, taken as a whole, of the aërial conveying plant in the developed form brought before us in the articles is comparatively modern. We have concentrated in them the experience of many years. Three decades ago saw aërial conveying applied to the handling of coal at the Hanover Gas-Works, with—thus early—an immediate reduction of the expense of transport to about 4¾d. per ton. The improved the successors of to-day, in large installations, have reduced the cost to 1¼d. per ton, under the conditions of their employment. We will not follow Mr. Dieterich further into his interesting articles, as sufficient has been said to cause those who have not yet perused them to do so, if they want to know the latest that has been said, from the technical standpoint, upon this particular line of transport development in gas-works. On the question of conveying work generally, there is room for a reduction of massiveness and elaboration; progress, in fact, must be towards simplification.

Herr E. Körting's article in our issue for Feb. 12 brings before us many points affecting the rights and wrongs in the methods of coke conveying; and what the author says is the outcome of actual working experience. It is from the experience of pioneers that followers reap much advantage in the way of saving, without any great cost to themselves. Herr Körting in his article attacks the breeze and the cost questions; and in both respects the mechanical conveying of coke comes out well—in regard to the former, not better than with direct-fired retorts and hand labour, but certainly the figures prove that, under the conditions of the Berlin works of the Imperial Continental Gas Association, there is not a great amount of difference between the proportion of breeze where gas-fired retorts are worked by hand and where they have their spent charges removed by conveyors—such difference as there is being favourable to the latter. This is the proper comparison that has to be made. Gaseous firing and higher temperatures have come to stay; and the figures in the article show that gas-fired retorts operated by hand labour produce the largest amount of breeze of all the systems of working. Therefore, it is not as between gaseous-fired retorts equipped with coke-conveying plant and the former conditions of direct-fired retorts and hand labour that comparison as to the production of breeze must be made, but between gaseous-fired retorts with and without conveying machinery. So regarded, the results from the illustrating works show that machine labour does not exert an unfavourable influence upon coke. Later-day conditions of working have contributed to further reduction of the make of breeze with conveying machinery. We remember that M. de Brouwer long ago demonstrated at the Bruges Gas-Works that a large amount of injury to coke could be averted by keeping, during the time of retort-discharging, the conveyor as full as possible, instead of carrying the coke away in thin streaks. Herr Körting emphasizes the point; and certainly the ram discharging of horizontal retorts, the bulky evacuations of inclined retorts, and those of vertical retorts where the process is not of the continuous order, produce with good effect—sometimes all too well—the recommended condition. It is another excellent piece of advice that the coke should be disturbed as little as possible during transit, by introducing as few breaks as practicable in the journey of the coke from the retort-house to the hopper or heap. From his varied experience, and from the figures yielded by that experience, the conclusion to which Herr Körting arrives is that, under like conditions, coke-handling plants yield notable industrial advantages which fully justify the extra amount of capital necessary for their construction being sunk in them. His conclusion is one that has had wide corroboration in experience.

The Allowance for Compulsory Sale.

The House of Commons has upheld the view of the Police and Sanitary Committee that any alteration in the practice and terms upon which compulsory sales of property are effected under the Lands Clauses Acts, ought only to be made directly by a Public Bill, and not be slipped in through the side door provided by a Private Bill. The alteration in practice and terms was desired by the Hull Corporation; and they have desired it from the time they first drafted the Bill for the expropriation of the East Hull Gas Company's property. The nature of the alteration was that the time-honoured allowance for compulsory sale—a practice that has obtained since the Lands Clauses Act of 1845—should be denied in this case. We have discussed the matter before, and completely failed to see why the Corporation of Hull should receive any preferential treatment in a matter that is impressed with the seal of custom over generations. The House of Commons—guided by the Ministry, through that most ardent of municipalizers, Mr. John Burns, and by the Chairman of the Police and Sanitary Committee (Mr. Corrie Grant)—could find no cause in this case for departing from established practice.

There is more, too, that is pleasing in this action of the

House than its mere connection with the expropriation scheme of the Hull Corporation. In view of the strongly defined countenance of municipalization by the present Parliament, it would not have been a matter for surprise if the voting had been favourable to the Hull proposal. That it was not, is one of the best things that the House has done in connection with the Collectivist policy to which support has been so strongly and strangely accorded this past year or two. It gives some authority for saying that Parliament, municipalizers though the majority of the members are, is not minded to let honesty be sacrificed to policy. "We are "all," said Mr. John Burns, "Collectivists by compensa- "tion nowadays." Compensation is not compensation when it is unfair; and had Parliament endorsed the action of the Hull Corporation in trying to force an unrecognized advantage in a compulsory transfer of a gas undertaking, Parliament would, at one stroke, have divorced many who adhere to the policy of Collectivism so long as it is prosecuted along lines that cannot be impeached as unjust.

The action of the Hull Corporation in persisting in the endeavour to gain this advantage is not altogether dignified; and the act of taking it to a division in the House was not altogether complimentary to the Police and Sanitary Committee. If the property they were seeking to buy had been old, inefficient, and ripe for the scrap-heap, and the business greatly neglected, there might have been some valid excuse for the Corporation thinking it rather hard upon them that they should be tied to the 10 or other percentage allowance for compulsory sale. But it is not so; for if the Bill ever becomes an Act, the Corporation will be purchasing plant that (it was sworn by one of their own witnesses, when the loan repayment period was being considered in Committee) is in good condition. The only thing that the Corporation had to rely upon was the clause in the Government Act of 1902 by which the Metropolitan Water Companies were extinguished and their undertakings were transferred to a Water Board. The Bill which developed into that Act was the promotion of a Conservative Government; it was not a Private Bill. And the clause in question was in direct opposition to the deliberate expression of opinion of Lord Llandaff's Commission, who had, in 1900, held an investigation into the whole subject. The Commission reported that they saw nothing whatever which led them to suppose that if the water undertakings were compulsorily purchased for the public advantage, Parliament would sanction any exceptional provisions, or depart from the terms of arbitration usual where the property of private persons was taken from them against their will. It was an exceptional provision that was put into the Act of 1902; and it was a departure from the usual terms of arbitration. Against it, we strongly protested at the time—recognizing both its unfairness to the Companies affected and the inspiration it might give to local authorities (as it has done in this Hull case) to try to gain an undue advantage in their expropriating excursions into the field of private enterprise. We are glad that the Hull Corporation have not succeeded, and doubly glad that it is the present Parliament that has repulsed this unwarranted attack on the customary terms of compulsory sale.

In the Progressive Pillory.

THE Progressives in local government and their friends who sit in the House of Commons have a grievance. It is leaking out bit by bit that certain large Companies contributed to the exchequer of that militant organization the London Municipal Society just before the last County Council election; and in doing so we think—the Progressives do not—that those Companies did well in their own interests, and in those of their patrons and employees. The Progressives and their parliamentary friends cannot find any other way of putting these Companies into the pillory than by asking questions about them and their contributions in the House. But instead of this bringing discredit upon the Companies concerned, the public are looking upon the opening of their purse-strings as an act of grace, and are applauding instead of censuring. Public opinion was up against the old order of things at the elections; and in its present mood, the public laughs heartily at the puny incidents in the resentment and attempted retaliation of those recently dethroned. The South Metropolitan Gas Company are among the subscribers to the Society; and the Company have been before the House wrapped up in a question to the President of the Board of Trade. The Company are impenitent. The reply that the Directors communicated to Mr. Lloyd-George (through Mr. Frank Bush) was evidently so much to the point that the President of the Board had it printed *in extenso* as the answer to his interrogator. It was a kind of *multum in parvo* communication—frank but altogether unapologetic, and full of plain justification. The Company subscribed the small sum of 20 guineas; and they have the satisfaction of knowing that this sum assisted in placing a check upon the waste and extravagance that was rolling over the land through incompetence predominating ability in local administration. There are no uneasy consciences over this matter among the Company's Directors. They are smarting under the payment of £88,000 a year in rates—an increase of 50 per cent. during the last seven years; and while the Company are paying this amount in rates, they have no representation, no voice in, or control over, local expenditure, and no vote in the election of those who have the spending of the local revenues, and whose actions produce the increase or the decrease. The revival of this question of taxation without representation is not what the Progressives and their friends intended should ensue from their investigations into the acts of these Companies. So long as joint-stock companies are denied the privileges of individual ratepayers, so long they have a moral right to give support to those organizations that best represent their views. And assuredly the views of the Gas Companies and the interests of all their patrons were well represented and served during the last County Council elections by the London Municipal Society.

Coalite in the North.

The wonders and charms of coalite have now been brought to the notice of people further north than Manchester. The "Northern Echo" has catalogued in its columns the claims of the promoters of Coalite Limited. These claims are mostly known to our readers; but like rumour they have a way of expanding with time and circulation. Coalite now offers to solve the smoke problem of Middlesbrough. The "principle" of manufacture, it is said, can be applied to existing gas-works; better and brighter gas will, under the system, be extracted from coal; and the price of gas ought to fall, since Coalite costs no more than coal. The argument is not clearly followed, but we suppose it is all right—for the journalists of the Daily Press. If half that has been told of Coalite were true, it would be a perfect mine of wonders. It is also announced that the patent is being "worked" by a London Company, and that the £1 shares are at "a fabulous price" on the market. "Northern subsidiary companies are talked of." We are getting well along the old lines of City tactics; but while all this sort of thing is progressing in the Daily Press, the active spirits of Coalite Limited do not take the "JOURNAL" into their confidence. Perhaps it is thought that among gas shareholders there are not many who will care for £1 shares at "fabulous" prices, or £1 shares that to-day may be predicted to see "fabulous" prices, but on the morrow may be going a-begging for buyers.

The Cost of Old-Age Pensions.

Some weeks ago—in the "JOURNAL" for March 19—we gave a few figures in connection with the Old-Age Pensions Acts of New South Wales and Victoria, and the probable cost of establishing similar pensions throughout the Commonwealth; and a fortnight later brief reference was made to an article contributed by Mr. John Holt Schooling to the "Pall Mall Gazette," in which the writer gave a calculation showing the serious financial burden that would result from the adoption of anything like a similar scheme in this country. His estimate was that the cost of a pension of 5s. a week (about half the amount that is thought necessary in Australia) to all persons over 65 would be £26,000,000; but there would, of course, be a saving on account of those persons who did not apply, or were not eligible (if a limit of private income were fixed), for the pension. Mr. W. Lever, in moving the second reading of the Old-Age Pensions Bill in the House of Commons some days ago, pointed out that in this measure it was proposed to provide pensions for all persons of both sexes at the age of 65 and upwards; but for the first year of the Bill's operation the age was fixed at 75, the next at 70, and the third year at 65. He admitted that an estimate of the cost of the scheme was difficult, because the number of people who

would forego their pensions rather than make the personal weekly application which would be imperative could not be known. He, however, calculated that it would cost between £5,000,000 and £6,500,000 to provide pensions of 5s. weekly at the age of 75 and upwards; from £12,000,000 to £13,500,000 at the age of 70 years and upwards; and from £18,000,000 to £20,000,000 per annum at the age of 65 years and upwards. Mr. Lever's suggestion for raising this enormous sum was "the extension of the system of a graduated income-tax, which should embrace even the man earning 20s. a week, who might be required to pay 2d. in the pound," while in the case of the rich man he saw no reason for "stopping at 1s." No doubt, it is a good idea to make that section of the population who will benefit by any such Act contribute, according to their means, towards the cost of it. Whether their share be a large or a small proportion of the total amount that would have to be raised, the scheme and the recipients of the pension would be very much the better for the contribution. There was a long discussion on the motion for second reading, which was agreed to by a large majority. Mr. Harold Cox, however, moved an amendment that the House should decline to proceed further with a measure which would enormously add to the national expenditure, until the country had had an opportunity of saying whether it was willing to bear the necessary burden of taxation. He showed that even the large outlay contemplated would, if the Bill passed, no doubt soon be exceeded, because it would be found that a pension of 5s. a week was an impossible sum to live upon in a great city like London. The principle of granting a State pension to all who desire it is one thing—the finding of the means by which such a thing could be done is quite another; and it is the latter side of the question particularly which is causing a good deal of anxiety to the British taxpayer. Mr. John Burns, after remarking that it was agreed something should be done, and that opinion was now divided only as to the means and the time, went on to say the cost must come out of the rates or taxes, and that, "whether the House realized it or not, it was the fact that this Bill would cost from £26,000,000 to £29,000,000 in the next three years." Further, he pointed out that they could not raise any of this money by increasing indirect taxation.

Coal for Firing Retort-Settings.

In another part of the "JOURNAL" will be found the principal portions of a paper on the above subject read at the annual meeting of the Illinois Gas Association by Mr. W. R. Rhoades, of Springfield. The English manager is so accustomed to stoking his furnaces with the coke drawn from the retorts—and the practice, moreover, enables him to dispose of a large proportion of this residual—that his thoughts do not turn to coal as the fuel, the use of which would leave him with more coke to throw upon the market. He will find, however, from the paper, that in America the employment of coal is by no means rare; and, indeed, that it sometimes pays better to purchase coal so as to release the more valuable coke. Mr. Rhoades works with settings of six retorts, with semi-regenerative half-depth furnaces having a grate area of about 18 in. by 42 in., with a fire-box widening at the top to about 36 inches, giving some 36 inches depth of fuel—reaching to from 8 to 10 inches below the arch, or as near to it as to allow of easy handling. His average result last year was 387 lbs. of "run of mine" coal per ton of coal carbonized, compared with 335 lbs. to 350 lbs. of coke formerly used. A point arose in the discussion as to whether firing with coal would not entail more labour than with coke; and most English managers would be inclined to think it would. Mr. Rhoades, however, says he had less trouble with his benches, better work from the stokers, and no worries from stoppages on account of soot. Another matter that engaged attention was the construction of the setting; one speaker maintaining that a bench as usually built would not last so long with coal firing as with coke. Mr. Bredel, who is an authority on furnace building, thought the grate should be designed with special regard to the fuel to be used; and he added that a grate could be adapted to coal or coke in two or three hours. Mr. Rhoades said that he did not think there was any difference in the life of the settings by using coal; and certainly there was 50 per cent. less trouble in handling them. On the score of economy, his experience led him to decide in favour of coal. Altogether, the paper and the remarks upon it present to English gas managers a new phase, and a by no means uninteresting one, of the carbonization question.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 541.)

SHORT as was last week for business purposes on the Stock Exchange—for the closing on Saturday curtailed it of a day—it was nevertheless just long enough to bring about a symptom of some relief from the persistent and depressing influences which have latterly oppressed the markets. Perhaps it is not easier to account for the recovery than it is to account for the depression; but it is gratifying to be able to record it, whether accounted for or not. At the opening there was no sign of real improvement. Consols and the gilt-edged division were heavy, the threatened agitation in the labour market affected the Home Railways, and the rest sympathized to an extent. The same conditions continued next day, with the additional emotions produced by the disturbances in India; so that things were, if anything, a shade worse. Wednesday commenced in the same mood, and all prices continued to fall; Consols at one time touching 84⅛. But shortly before the close, there was a little sign of a change. This proved to be the turning point, and next day the improvement was manifest. Consols and Home Rails were on the upward grade, the old apprehensions seemed to have abated, and there was some real buying for investment, though not on a huge scale. Thus the end of the week was a deal happier than the opening; and hopes were indulged of the improvement intensifying after the holidays. In the Money Market, the position was at first very easy; but, aided by the Stock Exchange demands, rates for loans hardened somewhat, and discount was similarly stiffer. Business in the Gas Market was not brisk; and prices were easier there as in other markets. In Gaslight and Coke issues, the ordinary relapsed a point, with transactions which ranged from 93⅜ to 92¾. The secured issues were very quiet. The preference was done at 103 and 104 (a fall of 1½), the debenture marked from 83¼ to 84½, and the maximum was not dealt in. South Metropolitan relapsed a couple of points, with bargains ranging from 123¼ to 122. The debenture marked from 83½ to 85. Nothing was done in Commercials. In the Suburban and Provincial group, Bromley "A" was done at 119½ and 120½, Brentford old was easier, and Alliance old advanced. Among the Continental Gas Companies, Imperial marked from 177 to 174 *cum div.*, and 170 *ex div.* European fully-paid marked 24, and ditto part-paid 18¼. Among the undertakings of the remoter world, Buenos Ayres marked 11⅛ *ex div.*, Primitiva 7⅛, and 6⅞ and 7 *ex div.*, River Plate 13 and 13⅛, and San Paulo 12⅝.

NOTES FROM WESTMINSTER.

As is invariably the case, in the few days preceding the complete withdrawal of members of Parliament from Westminster for holidays, things have been very quiet in the Committee rooms. Work was relinquished on Thursday; and prior to adjournment, there were only, so far as we are interested, two matters concerning water supply which claim mention.

Metropolitan Water Board's Bill.

The Joint Committee on the Metropolitan Water Board's Bill, for unifying the charge for water on a basis of 5 per cent. on the rateable value, have passed the Bill, subject to certain modifications. The evidence that was given during the three sittings previous to the decision was all more or less hostile to the proposals of the Bill. There is not the slightest doubt that uniformity will produce certain hardships; but, as we said last week, uniformity of charge was bound to follow concentration. Those who are grumbling now did not give sufficient consideration to this matter at the time—and it was a long time too—that the agitation for the acquisition of the Water Companies' undertakings was in full swing. The London County Council were the prime-movers in the agitation; and now they come and assert that, while the principle of a uniform rate in London itself is fair and reasonable, it will work hardly if applied to the outside areas at presentsupplied by the Board. It is not, however, the uniform water-rate that will be at fault, but the disuniformity of the systems of valuation within and outside the county boundary. Within the county boundary, the quinquennial valuation of property applies; while valuations outside are often old and obsolete. It is plain from this that, considering only the question of inner and outer districts, it is the disuniformity of the valuation systems that requires amending, and not the proposed uniformity of water-rate; for we can well imagine that, under existing conditions, there is greater disuniformity in water-rate paid by property within and outside the county boundary than is just to those within. The suggestion of the London County Council would only make "confusion worse confounded." Builders, bankers, manufacturers, and laundrymen all came up in numbers relating the hardships that will be imposed upon them. The Associated Manufacturers and the London Chamber of Commerce were dead-against uniformity, and proposed sliding-scales, both for domestic use and for manufacturing purposes—for the latter, as against the Board's proposed maximum charge of 1s. per 1000 gallons irrespective of the amount consumed. As to the bankers, Sir Felix Schuster told an interesting tale, to illustrate the hardship to places of business in the City. The Union of

London and Smiths Bank pay at present £907 per annum for water, which sum represents 2¼ per cent. on their rateable value, and £3 5s. per head employed. The £907 works out to 26 million gallons of water at 8d. per 1000 gallons. Whereas, allowing 10 gallons per head for Directors and employed for 300 working days, the consumption is 1,600,000 gallons. Sir Felix points out that, under the Bill, the charge will now be doubled. However, the Bill goes forward; the Joint Committee accepting the 5 per cent. on the rateable value as the basis of charge for domestic supply—any rebate given to be universally applied. The Committee have also decided that the Board shall allow a rebate not exceeding 30 per cent. on all houses above the rateable value of £300; the Chairman stating that on this basis the Board will be able at once to grant 20 per cent., rising gradually to 30 per cent. In place of the maximum charge of 1s. per 1000 gallons for trade purposes, a scale of prices is to be brought into operation, and one is to be submitted for the approval of the Joint Committee. Public authorities are to be charged 6d. per 1000 gallons; but the objects for which they may demand a supply are not to be increased. There are other minor changes; but that generally is how things stand as the result of all the contention over the Bill. Hardship in cases has been removed; but uniformity of charge has been established so far as private supply is concerned. We do not see that the Joint Committee could very well, all circumstances considered, have upset the principle of uniform charge; for disuniformity is opposed to the very ground on which the Board were brought into being.

Charges for Boarding Houses.

The little difficulty (to which reference was made last week) that arose over the Newquay Water Company's Bill, was adjusted last Tuesday before the Unopposed Bills Committee. The provision, it will be remembered, to which the Local Government Board raised objection was that which proposed giving the Company the right to charge for a twelve months' supply in the case of boarding and such like houses which were only occupied for business during the holiday season—it being thought that such a power in the hands of the Company would be detrimental to the town generally. The Company's position is one with which there can be sympathy, as they are compelled to construct additional works for the express purpose of meeting this supervening holiday supply. The promoters suggested a compromise, which gives them power to charge in such cases for a six months' supply. This was accepted as fair. Small point though this was, the Unopposed Bills Committee took a great deal of trouble over it.

ELECTRIC LIGHTING MEMORANDA.

The Turn of the Average Profit Tide—A Comparison of Prices and Working Charges—Depreciation—Packing Financial Responsibility on Gravesend Ratepayers—Advertising Electricity at Hastings—The More Economical Light.

THE "Electrical Times" has recently given a general summary of their useful records of electricity undertakings—London and provincial, company and municipal. The figures comprise 292 concerns, of which 208 are municipal and 84 company; and from their aggregated and average results, many points of interest can be extracted. There are only two or three, however, to which we can call attention. In the first table, it is noticed that in 1899 the average net profit earned per £100 of capital invested was £3·91; in 1905-6 it was £4·7. But in the meantime, the average price per unit—including supply for power, heating, and private and public lighting—has gone down from 4·06d. to 2·45d.; and, on the other hand, the working expenses per unit have receded from 2·23d. to 1·18d. The £4·7 average net profit per cent. of capital does not represent the peak of the average net profit since 1899; for we know well that the compulsory lowering of prices through competition, and the ridiculous lengths to which many undertakings have gone in taking on power and heating business at prices that (having regard to the load) does not pay them, the average net profit has been in many places on the decline. In the case of thirteen London Companies, the amount of net profit per £100 of capital was in 1904 £6·25; and in 1905 it was £5·95. That is a considerable drop, in view of the fact that the capital involved is over 12 millions. The twelve Borough Councils included are nearly as bad; their net profit per cent. of capital having declined from £4·56 in 1904-5 to £4·29 in 1905-6. Again in the Provinces, the companies slipped from a net profit of £4·27 per cent. in 1904 to £4·01 per cent. in 1905; while the provincial local authorities just maintained—we wonder how?—the figure of £4·38. In the case of the London Companies, the average price per unit in 1904 was 3·51d., and in 1905 3·23d.; the Borough Councils' prices for the respective periods being 2·93d. and 2·62d. Turning to the Provincial Companies, the price per unit receded from 2·67d. in 1904 to 2·10d. in 1905; while, in the case of the Provincial Local Authorities included in the tables—representing 196 undertakings—the average price only declined from 2·43d. to 2·25d.

The "Municipal Journal" has been trying to make capital out of some of these figures, to show of what splendid fellows the old Progressive Borough Councils in London were composed, and how well they managed things electrical. The average price charged per unit in London shows, it is pointed out, that cheapness is on the side of the Borough Councils—their charge being 0·61d. per unit lower than that of the Companies. But there is nothing to cause astonishment here; for the tendency of some of the Borough Councils during the Progressive *régime* was to see how near they could get to giving electricity away to consumers at the expense of the ratepayers. The deficiencies of net profit to meet interest of Battersea and other places are remembered; the revelations by the District Auditor of the Local Government Board concerning some of the other undertakings—Woolwich and Bermondsey for instance—are not forgotten; and there is ample ground for the belief that, if adjustments were made between improper and proper allocation of expenses, if less was squeezed out of the ratepayers for public lighting purposes by the Borough Councils owning electricity concerns, and if the affairs of other Councils were brought into the reckoning, that not only would the working expenses of the Councils per unit be higher than in the case of the Companies, but that the average charge per unit would also be forced to a higher average. The Companies' undertakings stand on their own feet; the Borough Councils' undertakings are kept from falling by funds drawn from the ratepayers. Reports by Mr. Carson Roberts will show what we mean without troubling to go over old ground. But the "Municipal Journal" has an awkward nut to crack, in that the provincial electric lighting companies show the lowest average price per unit in the country. Our contemporary passes over this fact lightly; remarking that the records relating to provincial undertakings are not so valuable, as they are necessarily incomplete. The undertakings included in the London figures are less by some half-a-dozen than there are actually in existence; and there are certainly two or three local authority undertakings represented in this half-a-dozen the inclusion of which in the London returns would have made them more valuable. Seeing that the provincial municipal undertakings included account for 196, and the provincial company concerns for 70 of the 292 dealt with, and represent over 35 millions of capital, we think it may be taken that the figures for the provincial undertakings are equally as useful and as representative as those of London. For these reasons, we do not think that the figures show sufficient ground for any such elation as that to which our Progressive contemporary has given vent; and we cannot subscribe to the declaration that they prove that local authorities manage their electricity concerns more economically than companies.

One other point on the well-worn subject of depreciation. We rather suspect that it is only because it is inconvenient, that the "Municipal Journal" will insist upon refusing to recognize that, when a business is started and run on borrowed money, which has to be repaid, it is an economic process to put by money, in a depreciation fund, for replacements. Otherwise, when renewals are requisite, reborrowing has to be resorted to, and the long period through which money for repayment must be provided has to be repeated. The repayment of borrowed money does not provide funds with which to replace; so how can money that is so utilized be, by any stretch of imagination, called a depreciation fund? The £1·72 per cent. that the London Companies put on one side for depreciation and reserve is something tangible and available over and above the sum the local authorities set aside for sinking fund—viz., £2·14 per cent. We remember in this connection that the London County Council have more than once admonished Borough Councils for not making sufficient provision for sinking fund, by not according the provision made with the percentage prescribed by the Council for loans spent on different subjects. The "Municipal Journal" also boasts that the London authorities had £143,646 available for interest, &c., "all of which in some form or other went back to the public." A large amount of it was taken from the ratepayers through the excess paid for electricity in comparison with gas lighting for public purposes; and, after all, the sum named only represents about 4½ per cent. on the expended capital. There cannot, therefore, have been very much left for the public after the people who lent the money had been paid their interest.

The Gravesend and Northfleet Tradesmen's Association is an enterprising body. It has lately given an opportunity for the public discussion of the affairs of the Gravesend electricity undertaking, which discussion has been reported at considerable length in the local papers. In this way, the attention of the ratepayers has been directed to several matters upon which, judging from the exclamatory remarks during the progress of the debate, they very much wanted enlightenment. The Corporation are—under an agreement with the Northfleet Council—about to extend the electricity supply to that district. The Corporation are committed to the extension; so that the only good served by discussing it now is to forewarn the ratepayers of Gravesend as to what looks likely to be the result. It is estimated, if this and that work out all right, that there will be a liberal revenue from the district; but not much is said about the fact that if this and that do not work out all right, and there is loss, the Gravesend ratepayers will have to bear it, and not the Northfleet ones—Northfleet being under distinct administration. The prospects are not good for the ratepayers of Gravesend. They have already had one taste of supplying funds for propping up their electricity concern; and before the undertaking has time to discharge its obligation to the ratepayers, the Corporation enter into this agreement with Northfleet, which is sure to make more remote the day when the undertaking's debt to the ratepayers will be cleared off, and when the electricity consumers will reap benefit in the way of reduced price. Of course, while the Corporation will commit

themselves in this foolish way, so much the better is it for the Gas Company.

It has been suggested that the position of the undertaking does not warrant the projected extension. The business in Gravesend has now been running some four to five years; and the capital expenditure amounts to £79,661. There have been deficits, amounting to £3747, of which £1308 was spent in law costs. In one year, a net profit of £29 was obtained by persevering accountancy and making no provision for depreciation, and last year there was a net profit of £786. In addition to a close paring in making up the accounts, and not setting anything aside for depreciation, these amounts would not have been obtained had the ratepayers not been saddled with an expense of something like £1100 more than they were bearing formerly for gas lighting, which popular opinion assures us was every whit as good as the electric lighting to which it was forced to give place. And yet the price for electric lighting works out to £750 per mile of road lighted! The arc lamps are being charged at £30 and £35 each. Again, Corporation departments patronizing the electric supply undertaking are not allowed the discounts granted to other large consumers. From these facts the ratepayers cannot have any difficulty in appreciating how it is the Electricity Department are now showing something that is called net profit. The extra cost per annum for public lighting must be counted a loss to the ratepayers, for we have yet to hear an acknowledgment that they are in any way the better for having to find this additional sum per annum for extra illumination in certain short lengths of roads. It is extravagance pure and simple.

The controversy between gas and electric lighting has broken out afresh at Hastings, by the dissemination of statements by the Corporation Electricity Department which are mendacious in their suggestiveness and in form foolish to the extreme. Suggesting points for consideration on the question of, "Which is the cheaper light?" it is submitted, in one of the Department's advertising circulars, that "a cut from a New Zealand lamb may be good and cheap; but is it as good as a cut from the primest home-bred animal?" This is a bit enigmatical; for we cannot trace any relationship between New Zealand lamb or the primest home-bred animal and the question of gas and electricity—both the latter being home-bred, but one being much cheaper than the other. The author of this circular cannot be congratulated on his literary style—for example, "Which poisons the atmosphere, the blood, giving rise to lassitude and headache?" and "Which pays best to a business man?" The former question also contains suggestion which is absolutely false. There is much else in the circular in question with which we have not space to deal here—seeing that the matters are all receiving consideration in our series of leaflets "Illuminating Truths for Householders and Others." Before answering such questions as those presented in this circular, the reading of these leaflets will enable every householder or shopkeeper to arrive at a proper conclusion. There is only one other point in another published statement—for which the Borough Electrical Engineer (Mr. Ferguson) holds himself responsible—with which we will deal here. He directs notice to the fact that Baron von Welsbach has produced metallic filament lamps which consume only 1·5 watts per candle power per hour. These lamps, giving a light of 25 to 26 candles, therefore use about 37 watts per hour. Mr. Ferguson does not tell uninitiated readers at Hastings that the lamps cannot be run alone on circuits where the voltage is as high as that in vogue at Hastings, and that two of the lamps would consequently have to be connected in series at each point of lighting. Therefore at each point of lighting, there would be a light of about 50 candles, and the consumption of electricity would be, not 37 watts per point, but 74. A unit of electricity would therefore only feed that point of light for some thirteen hours. With the bijou inverted gas-burner, a light of 25 candles can be obtained for the expenditure of 1 cubic foot of gas; and therefore with these lamps a light of 50 candles can be secured for fifty hours on a consumption of 100 cubic feet of gas. Gas has not stood still, any more than has electricity. But we still take the lead in economy. The ratepayers are also invited to remember that in supporting the Electricity Department they are helping themselves, inasmuch as the success or failure of the department is reflected in the call for rates. That is one of the most damning arguments that could be used against municipal trading. Ratepayers will also remember that, in supporting the department, they are buying light in the dearest market, and their patronage of the market does not protect them against calls on the rates. With electricity there is no guarantee of anything, excepting a big account out of all proportion to the amount of useful duty rendered.

It is now announced that the Fourth Engineering Conference of the Institution of Civil Engineers will be held on the 19th, 20th, and 21st of June, commencing each day at 10 a.m., and the Annual *Conversazione*, on the evening of the 20th of June, at the Royal Albert Hall.

Particulars have recently been published regarding a new metal, known as "Silvo," which is being placed on the market for general engineering purposes. The advantages claimed for it are that it is stronger than steel, is very tenacious, highly ductile, non-corrosive, takes a polish equal to silver, is very durable, and resists the action of acid and sea water. "Silvo" tubes have already been used for fittings on the two latest Cunard liners.

ILLUMINATING TRUTHS FOR HOUSEHOLDERS AND OTHERS.

(5)*

ON RELIABILITY, WITH INSTANCES OF MISPLACED CONFIDENCE.

WHO will gainsay that, from many points of view, reliability of the supply of the means by which light is secured during the hours of darkness is of first-rate importance? The safety of life and property, the protection from violence in the streets, and the continuity of business during the later trading hours of the day, and of social pleasure and recreation in the evening, all depend upon the reliability of the supply of the means of producing artificial light. The means, too, by which artificial light is procured—whether gas or electricity—are the means by which in the industrial world motive power is largely obtained; and so the importance of reliability to manufacturers also cannot be under-rated.

General Experience.

In the consideration of this question of reliability, the personal experience and general knowledge of readers render light the task of impressing certain points. There are few people in the country who can say that, in the towns in which they reside, there has ever been a general collapse of the gas supply; but how few can say that they have not heard, or have not had personal experience, of breakdowns of the electricity supply within districts and premises? Taking the country through, therefore, most men will be prepared to affirm, from their own knowledge, that between the two forms of lighting—gas and electricity—the merit of reliability is on the side of gas. It is indeed difficult to imagine, in the present day and in any fair sized town, any possible set of conditions that would bring about the degradation of gas by a cessation of the supply. Temporary stoppages of supply have been known. But they have been very rare; while collapses of electricity, within premises or generally within districts, are so frequent as to constitute a nuisance, and oftentimes a public danger. The few breakdowns there have been in the long history of gas lighting have been of small account—mostly in places of such limited population that the gas-works are necessarily on a modest scale, and an accident in one part of the plant has caused stoppage of the whole until the mishap has been remedied, or maybe a temporary suspension of supply in such places, where two or three men suffice for the whole work of gas production and distribution, has been caused by oversight or neglect. It is, however, safe to assert that such accidents cannot happen in the larger gas-works; and appeal may be made to experience for confirmation of this.

Reliability of Lighting in the Home.

Nothing can cause more vexation in the home life than the collapse—sudden and complete—of the means of lighting; and it often happens that the breakdown of electricity occurs at the most inconvenient time. Generally in domestic mishaps, the householder or his family can help himself or themselves, and easily amend or retrieve. In the case of a collapse of the electric current, or other mischief in connection with an electrical installation, the householder is absolutely helpless. In the case of a general collapse, his relief from distress is entirely in the hands of the staff at the electricity station; in the case of some derangement in his house lighting system, he is dependent as a rule for speedy relief—if speedy relief is possible—upon his ability to lay hands upon some skilled person, either from the electricity station or from an electrical contractor's.

Spoilt Social Evenings.

It sometimes happens—it is the ill-fate of the electricity user—that mishaps occur with the electric lighting installation in a house just when a number of friends are spending an evening there. When entertaining, it is the natural wish of host and hostess that everything shall go right, and that the whole house shall be bright to enhance the gaiety and pleasure. A well-lighted house goes far in adding to pleasure; and when the electricity user desires his house to be illuminated to the utmost extent of his fittings, then—it has been the writer's experience—it is not an uncommon thing with electricity for something to go wrong. If there is not sharp relief, the enjoyment of the evening is marred, and host and hostess are made to feel very miserable. After the novelty has worn off of finding oneself suddenly merged in absolute darkness with friends all round, after the joke of the inquiry "Are you there?" falls flat, and after personal stocks of matches have been exhausted in trying to relieve the monotony while substitutes for the errant electricity are being discovered, then there is unison in misery between guests and host and hostess. It is a weird kind of thing, too, trying to renew interrupted recreation, or dinner or supper, by the aid of a few candles. And, in fact, the evening is spoilt, if there is no chance of obtaining immediate succour from the electricity station or a local electrical contractor. In one experience of this kind, relief was only obtained two-and-a-half hours after the main fuse at the

[*These articles are being published in leaflet form for distribution among householders generally and shareholders in gas companies. An announcement on the subject appears on p. 545.]

meter had faithfully discharged its duty; and when the relief-ministering angel with his tools did arrive, he apologized for his delay by informing the waiting company that his indispensable presence had been required in nine or ten other places that same evening.

The Parable of the Wise and Foolish Virgins.

It is, the writer finds, becoming a common thing for electricity consumers to lay in a stock of oil-lamps or candles, for many have been caught like the foolish virgins; and they have persuaded themselves of the truth that they know not when their electric light will fail them. When this has happened, it has no doubt often occurred that the foolish have said unto the wise: "Give us of your oil; for our lamps have gone out." But the wise have answered saying: "Not so; lest there be not enough for us and you; but go ye rather to them that sell, and buy for yourselves." The better plan is not to discard gas-fittings; for gas is always the ever-ready and unfailing servant.

Responsibility and Public Resorts.

For all places of public resort—churches, chapels, theatres, halls, public institutions of all kinds, railway stations, and streets—a very great responsibility rests upon those who have the choice of the lighting system. Where a large number of people are congregated within a building, the sudden failure of the light may lead to panic, and panic to loss of life; where there are failures of light in the streets—and that is a fairly frequent occurrence—it is a fine opportunity for thieves and accident.

In several churches and chapels, there has been failure of the electric light; and services have been brought to an abrupt termination. Happily, we have no record of any loss of life on such occasions; but, when anything of the kind does occur, the possibility of dire consequences cannot surely be contemplated with equanimity by those upon whom the responsibility rests for the safety of those whom they have been the means of bringing together. In the case of gas, a mantle may collapse; it only affects one light. In the case of electricity, one small mishap to the installation, one accident at the electrical station, may plunge into complete darkness the whole building in which a large number of people are assembled. This is no light matter for consideration. Furthermore, it is not always a local mishap or an accident at the electricity station that will cause disaster. Such an accident as occurred at St. Silas' Church, Blackburn, on Sunday, May 12, would not have happened if incandescent gas-burners had been the mode of lighting. The evening service was proceeding, when suddenly the church was plunged in darkness—a flash of lightning having fused the electric wires. In the confusion which followed, several ladies fainted. The sermon was preached by candle light. Numerous instances of places of worship safely, cheaply, and efficiently lighted by incandescent gas-burners—many by the inverted type—are on record; and the results of experience can be obtained through the local gas office or the firms who have fitted up such places.

In London, owing to the uncertainties of electric lighting, the County Council compel all the theatres to have available current from two distinct sources of electricity supply; and there are regulations existing in London applying to other places of public resort and public institutions where electricity is used—all of them having for their object the protection of the public, owing to the fact that full confidence cannot be placed upon the electrical means of lighting.

No matter the character of the place of worship, of amusement, or of institution, it is emphatically maintained that the responsibility for the provision of the safest means of illumination rests upon those in whose hands the management of such places reposes. It is a grave responsibility; and practical and protecting considerations ought in those cases to rise superior to any fancy for being "in the fashion."

Reliability in Shop Lighting.

In a former article, the fire risks of electricity have been dealt with [Article No. 3]. That is an extremely important matter for shopkeepers; and next to it comes reliability. The experiences (referred to hereafter) in London, in Paris, in Berlin, and in many other places, all between December and May last, should convince every tradesman that he incurs serious risk of loss by putting his trust solely in electric lighting. The shopkeeper whose best hours of business are, in many classes of trade, after other people have finished their work for the day—after offices are closed, after workrooms, factories, and warehouses have disengaged their hands for the evening—requires the most reliable means of lighting, and the means of lighting that he can have confidence in saying will not place him in a most awkward position just at the best of all shopping seasons—that at Christmas time. For such seasons, large stocks have to be purchased; and every selling hour is of great importance. Where, too, the goods are of high value and portable, it does not do, in these days when, to put the point politely, kleptomania is so rife, to find one's shop in darkness, and the doings of a shop-full of strangers blocked from view. Reliability of lighting in the case of shops is therefore of the utmost consequence. A tradesman wants good, reliable, and cheap lighting, and not a means of lighting in which so many risks are run as with electricity. The good, reliable, and cheap lighting he can always obtain by using incandescent gas-burners.

Reliability in Industrial Establishments.

In industrial establishments, an unreliable system of lighting, or unreliable means of obtaining motive power, may result—and has resulted—in considerable loss of profit to employers and loss of time, and consequently of wages, to employees. For both the matter is a very serious one. Nowhere is the truth of the aphorism "Time is Money" so vividly brought home as in an industrial establishment, on a forced stoppage of business through a breakdown, even though the stoppage is only of short duration. Manufacturers have never been known to suffer loss through cessation of the gas supply from a town's mains; but they have been through the stoppage of the electricity supply. But the damage thus occasioned is not recoverable from the electricity suppliers; small penalties are for failure to supply, but not the resulting damage.

Touching this point, some extracts from an article in the "Electrical Review" will be instructive.

Upon occasions when the consumer is troubled by failure in the supply of electricity, he may be compelled to seek and enforce some remedy against the supply authority who have failed to perform their obligations. He may, of course, summon the company for penalties; but the penalties ordered to be paid are generally insufficient to compensate for the injury sustained. A recent case, however, serves to show that unless the Provisional Order authorizing the supply is drawn in some peculiar way, this is the only remedy. The case in question is *Morris and Bastert v. Loughborough Corporation*, which was decided in the King's Bench Division on Oct. 26, 1906. The Act imposed upon the defendants an obligation to supply energy to owners and occupiers of premises within the area of supply upon their being required so to do, and provided that "Whenever the undertakers make default in supplying energy to any owner or occupier of premises to whom they may be, and are, required to supply energy . . . they shall be liable . . . to a penalty." The defendants failed to supply energy for a certain period; and the plaintiffs thereupon brought an action in the High Court for damages for breach of the agreement. It was held by Mr. Justice Bigham that the penalty section applied in all cases where, under the provisions of the Act, the defendants supplied energy, and that no distinction could be made between cases where the supply was controlled as to price by virtue of an agreement, and that, therefore, no action for damages in respect of failure to supply could be maintained.

Street Lighting.

In connection with street lighting, interruptions of the supply of current to electric-lighted streets, and their sudden plunging into darkness, places pedestrians largely at the mercy of plunderers, disorganizes traffic, and immediately produces conditions likely to lead to serious accidents. This consideration does not weigh sufficiently with those responsible for the public lighting.

A Few Examples of Failures of Electricity.

A long list of failures of electricity supply could be compiled; but a few representative ones only need be given to show that such collapses are fairly common, are not confined to any particular locality or system of supply, and affect alike all users—public and private.

In Oxford Street.

When anyone speaks of Oxford Street, without further defining locality, they mean the great and important thoroughfare of that name in London. The characteristics of Oxford Street are too well known to need recapitulation for the purpose of impressing the importance of reliable lighting in the shops with their wealth of display and stocks, restaurants, places of entertainment, and vehicular and foot traffic. With all its wealth, Oxford Street could not be protected from the failure of the electricity supply. During the shopping season, at Christmas, 1906, there was a failure; and this was succeeded by another early in the new year. These two failures came without the slightest warning, when the shops were thronged with customers. On both occasions there was great alarm among the shopkeepers and their attendants and patrons. On the part of the former, there were frantic rushes for oil lamps and candles; on the part of the latter, the same for the doors. The shopkeepers, too, had to guard their doors in order to prevent pilfering. On the first breakdown, one manager of a shopping establishment is reported to have said "that thousands of pounds were lost in sales to Oxford Street" that evening. On both occasions, the failure was due to an accident at the electricity station—an accident which was described by the Chairman of the Marylebone Borough Council Electricity Committee as one to which "electric plants are very liable."

In South London.

At Christmas time, too, a lamentable boiler explosion occurred at the principal station of the South Metropolitan Electric Light and Power Company. The supply of electricity to a large area was affected; and shopkeepers especially suffered serious loss of business. Some weeks elapsed before the supply was completely restored, during which weeks gas lighting was again brought into use in many places. Those tradesmen who had not had their gas-fittings removed were in a position to continue a profitable business, were envied by others, and were able to heartily congratulate themselves. They found that "it is an ill wind that blows nobody good."

In Cardiff.

At Christmas time, too, there was a failure of the electricity supply in one district; and shopkeepers and private residents were put to great inconvenience.

In Paris.

Through a strike of the electrical employees on March 8, Paris suffered hugely (where gas had been disestablished) through the suspension of the electricity supply. Streets and private houses were

deprived of illumination, the restaurants and cafés could not successfully conduct their business, music halls and theatres had to be closed, in offices and shops business was promptly terminated, industrial and other concerns were suddenly brought to a standstill through the cessation of the energy required to drive their motors, and newspapers could not be printed.

In Berlin.

Business and pleasure were without warning brought to a standstill in an important section of Berlin on Wednesday evening, May 8, through a stoppage of the electricity supply. The experience was much the same as in the case of Paris. Shops were busy at the time; and the shopkeepers had their customers suddenly cut from view. Cafés and restaurants were greatly inconvenienced, certain places of amusement had to be closed, and at the Opera House the money paid for seats had to be returned.

At Barnes.

The municipal electric light supply at Barnes failed about half-past seven o'clock on Tuesday evening, April 7, and left the town in darkness where gas was not available. Many tradesmen utilized candles in their shops, while others quickly closed their establishments.

In Churches.

In consequence of a defect in the electric light cable supplying the northern part of Portsmouth, several places of worship in the district were considerably inconvenienced on a Sunday evening in November, 1906. Large numbers of candles were requisitioned; and these, with primitive holders in the shape of bottles, enabled the services to be duly conducted. This, of course, refers to those places where there were no gas-fittings. Where these had been retained, no inconvenience was experienced.

One evening in the same month, through the fusion of an electric wire at the Broad Street Chapel, Reading, a large congregation was plunged into darkness, and there was considerable alarm.

Also in the same month, the electric light failed in a York Church, though two circuits had been provided for safety.

In Theatres.

The fusing of an electric wire one evening early in May was responsible for a considerable amount of commotion and no little alarm at Oldham. The theatres, hotels, and public buildings were thrown into darkness; and at the Empire Theatre a panic was narrowly averted.

During a performance at the Duchess Theatre, Balham, one Wednesday evening in August, 1906, the theatre was plunged into darkness by the failure of the electric light. Several gas-jets were brought into use without delay, so that there was no panic; and the audience waited quietly while the staff worked hard (but in vain) to restore the supply of current. Regretfully, the manager informed the audience that it was impossible to continue the performance.

At the Portman Rooms.

During a concert in the Portman Rooms, London, one evening in November, 1906, the electric light failed.

In Industrial Establishments.

Reference has already been made to the claim made against the Loughborough Corporation by a manufacturing firm for damages through failure to supply electrical energy to them. In consequence, for about six hours, their works were stopped; and something like 200 workmen were thrown idle, and sent home.

At Coventry, owing to a breakdown of one of the boilers at the Corporation electricity works, great inconvenience was caused to power users early in November, 1906. The breakdown necessitated, said the "Midland Daily Telegraph," "for the time being, a large diminution in the consumption of electrical energy for power purposes, and a revision of working hours in the factories affected, among which were many prominent cycle and automobile manufactories."

In any general breakdown (apart from mishap to internal installations) industrial establishments relying upon electrical energy for lighting and power would suffer loss.

At the "Electrical Review" Office.

The following paragraph appeared in the "Electrical Review" for March 1, 1907: "As we go to press with our last pages, our electric light has gradually faded away. First the Nernst ceased to glow, at 12.10; the carbon lamps maintained a feeble glimmer for half an hour longer, and then gave up the ghost. We are now writing by the light of a tallow candle, stuck on a cocoa tin! We thought the Charing Cross Company welcomed foggy days! Our neighbours on the City Company's mains are more fortunate."

Many more failures could be referred to, some affecting whole districts, and others parts of districts—such as at Battersea, Ventnor, Eastbourne, and in certain South London suburbs. The examples quoted, however, will be considered sufficient. On the testimony of a long experience, it is claimed that for all purposes—lighting, cooking, heating, and industrial uses—

GAS IS A MORE CONSTANT SERVANT THAN ELECTRICITY.

North British Association of Gas Managers.—The Secretary of the Association (Mr. R. S. Carlow) has sent out the usual preliminary circular for the annual meeting, which will take place in Glasgow on the 25th and 26th of July. With the view of making the proceedings equal in interest and profit to those of previous meetings, he invites the assistance of the members in contributing papers, and gives a long list of subjects, embracing practically every branch of gas manufacture and distribution, from which to make a selection.

COKE FOR SUCTION-GAS PRODUCERS.

It would seem that the stress of competition with suction-gas plants is likely to be in part, at all events, mitigated by the use of coke as fuel for the producers; and that therefore where loss in gas revenue is sustained from the possible substitution of suction for town gas, some indirect gain may accrue to another—the residuals—branch of the gas undertaking, tending to reduce the net cost of manufacture. The use of coke for suction-gas producers would not merely compensate to some extent for any diminution (though the serious character of this probably has yet to be proved) in the sale of gas for engines, but also bring fresh custom in those cases where steam or electric, rather than gas, power has been displaced.

It will be remembered that the trials of various suction-gas plants made by the Royal Agricultural Society at Derby last year demonstrated that coke could with some little success be used as fuel for producers. The Society's report directly stated that the coke trials were of special importance, since this fuel could in most districts be more easily obtained than anthracite, and, apart from the possibility of the trouble from tar due to imperfectly carbonized coke, would generally prove a cheaper fuel notwithstanding the greater weight consumed. The comparative figures of the anthracite and the coke fuel tests were made with good suction-gas plants working under the best conditions—that is to say, under expert supervision. The fuel needed for starting the plant and for banking during the night was included. The resultant fuel consumptions of the four best plants were as follows: Anthracite, 1·1 lbs.; coke, 1·3 lbs. per brake horse power. The average in the case of the anthracite for full and half load was 1·35 lbs.; that of coke not being given. Keeping to the comparative figures on the full-load basis, the particulars given of some fourteen different plants disclosed the fact that with these producers the anthracite fuel consumption varied from 1·04 lbs. to 1·48 lbs. per brake horse power; whereas with the same producers the coke consumption ran from 1·21 lbs. to 1·64 lbs. The mean of the results was respectively 1·26 lbs. per brake horse power for anthracite and 1.42 lbs. for coke—a difference of 0·16 lb. only against coke. The report suggested that, so far as the latter was concerned, there was considerable uniformity in the fuel consumption, though coke was "generally found to be more difficult fuel to deal with in suction producers than anthracite.

Notwithstanding this statement, it is encouraging to note that suction-gas users, evidently driven by the increasingly high price of anthracite, are turning their attention to coke as fuel, and, moreover, are obtaining very successful working. The "Gas and Oil Engine Record" for April has drawn attention to the question generally, and states "that there is no reason in the world why coke should not be used; its use depending upon two things, viz., the proportions of the generator and the quality of the coke"—points already referred to in these columns on Jan. 8 (p. 87). In reference to the generator, should the internal diameter be unduly restricted, the draught of incoming air, induced by the suction of the engine piston, will produce fierce combustion at the fire-grate level, with consequent high temperature favouring the formation of clinker. The amount of clinker can, however, be minimized by the supply of more steam.

After dealing briefly with the chemical reactions in the producer, our contemporary further suggests that, where the capacity of the generator is limited, the gas from coke may be improved by breaking the fuel into small pieces, thus exposing an increased surface to the gases. The fuel, however, must not be too compact; otherwise extra resistance is thrown upon the engine But so long as the coke is not too small, good working results may be obtained. The generator dimensions will only give trouble in those cases where the engine is getting beyond the efficient gas-making possibilities of the plant under full load. The quality of the coke is of some importance, in consequence of the amount of ash that may be present necessitating more frequent charges and removal of ashes. Coke contains a higher percentage of sulphur than anthracite; but experiments conducted at St. Louis have proved that special means of purifying are unnecessary. The high temperature prevailing in the cylinder appears to prevent corrosive action; the engine at St. Louis having worked for many months without any harmful effects being noticed.

Tarry matters in coke may cause trouble with sticky valves; and an additional scrubber is suggested, with extra attention to the purifiers. The scrubbing plant, however, even with anthracite producers, is frequently insufficient; a second scrubber being advisable. The "Record" closes with the remark that "a few careful experiments by the man in charge, based upon a knowledge of the underlying principles of suction-gas production, will in nine cases out of ten allow coke to be used." This opinion is borne out by the experience of suction-gas users; some, indeed, finding coke not merely more economical, but giving a cleaner fire than does coal.

Anthracite prices at Swansea are at the present time ruling fairly high; being about 25s. per ton for nuts and 14s. 6d. for peas, compared respectively with 17s. and 11s. per ton last year. Carriage will in many cases add some 50 per cent. to the cost; and local prices should make suction-gas users give serious attention to coke—bringing, as the "Gas and Oil Engine Record" phrases it, "good business to the gas companies."

The true comparison of cost is probably between coke and anthracite of the nut variety. It is said that many suction-gas

plants are designed for burning nuts ⅝ inch to 1¼ inches in size—a size which is not only limited in quantity but costs more to prepare. The use of peas is not altogether economical, since wastage may easily occur through the smaller coal tending to pass through the generator and mix with the ash without being gasified. At the same time, trouble occasionally results from coal dust going forward and choking the gas-piping.

The moral of the present position seems to be that, in view of the small difference in fuel consumption per brake horse power—1·42 lbs. of coke, compared with 1·26 lbs. of anthracite—and the enormous difference in the prices of these two commodities, it will not only pay suction-gas makers to employ the former fuel, even at an enhanced price, but also gas undertakings to specially select well carbonized coke and screen it to nut size for their use.

PERSONAL.

In the offices of the Gas Accountant of the Nottingham Corporation last Thursday evening, an interesting gathering of the staff took place to bid good-bye to Mr. CHARLES RAWLINGS, one of the clerks, who is shortly going to Australia. The staff, as an expression of their esteem and goodwill, had subscribed a purse of gold as a parting gift; and the presentation was made by Mr. W. Garton, the Accountant, who referred to the very satisfactory nature of Mr. Rawlings' work in the office, to the high regard in which he was held by all his colleagues, and to the unanimous good feeling prompting the gift. He wished him, on behalf of the subscribers, great success in his new field of labour, and added a few words of sound advice. Mr. Rawlings, in acknowledging the presentation, said he should always have pleasant memories of the time he had spent in the Nottingham Gas Office, and of the true comradeship of his colleagues. He thanked them heartily for their kind and generous gift.

Our congratulations to Mr. ALEX. A. JOHNSTON, of Ilford. He has been appointed Engineer and Manager of the Brentford Gas Company, in succession to Mr. James Husband, whose resignation of the position was recently announced. Mr. Johnston has had a varied experience. His introduction to general engineering work was in the office of the Surveyor to the late Metropolitan Board of Works, where he spent some three years. For a similar period he was with Messrs. James Simpson & Co., Limited, of Pimlico; thence he went to the Nine Elms station of the Gaslight and Coke Company—going through all the several departments. Mr. Johnston left Nine Elms in 1899 to commence his work with the Ilford Gas Company, as Assistant Engineer. From assistant he succeeded to the chief position, at the end of 1902, on the appointment of Mr. J. H. Brown to the office of Engineer and General Manager of the Nottingham Corporation Gas Department. At Ilford, Mr. Johnston has had an experience which eminently fits him for the Brentford appointment. The inclined retort system, as is well known, is the vogue at Brentford; and inclined retorts have been used at Ilford for many years. Competition with electricity has been very keen at Ilford; and it has been met with great vigour, and successfully.

OBITUARY.

The death occurred suddenly last Sunday, at his residence at Pangbourne, of Sir BENJAMIN BAKER, K.C.B., F.R.S., &c., the engineer of the Forth Bridge and the great dam across the Nile at Assuan. Deceased was occasionally consulted in connection with gas and water undertakings; and some years ago he reported upon the stability of the large gasholder in the Old Kent Road. He was in his 67th year.

It was with much regret that we received the news last Friday of the death, early the previous morning, of Mr. FRANK MORRIS, who for many years was the Engineer of the Brentford Gas Company. Deceased complained on Sunday week of having taken a chill. Acute influenza followed, and he succumbed to heart failure. In early life Mr. Morris was with the late Mr. Robert Jones, the Engineer of the Commercial Gas Company. He obtained his appointment with the Brentford Company in 1865, and held it till 1897, when he was invited to fill a vacancy on the Board caused by the death of Mr. J. Orwell Phillips. He was succeeded by his assistant, Mr. James Husband, who, as already notified in the "JOURNAL," has quite recently relinquished the position. Though Mr. Morris never came prominently forward as a gas engineer, he was known to many in connection with the water-tube condenser bearing his name and that of Mr. S. Cutler, for which patents were taken out in 1877 and and 1881. He was one of the first in this country to recognize the merits of the inclined retort system of M. Coze; and it may be remembered that, as the result of a visit paid by him to Rheims, an installation of retorts on this system was put in operation at Brentford, where it was worked successfully. In conjunction with Mr. Van Vestrant, he took out a patent on Oct. 18, 1889, for a method of charging inclined retorts; and also one on his own account shortly afterwards. Mr. Morris was not, so far as we remember, connected with any of the Associations of Gas Managers; but he was admitted into the Institution of Civil Engineers as an associate member on Feb. 1, 1870, and was raised to membership on April 30, 1878. Deceased was in his 68th year. The interment takes place at Putney Vale Cemetery at half-past two to-day.

GAS-TURBINES.

DURING the last two years or so our columns have recorded some valuable papers upon the problem that is suggested by the above heading—"Gas-Turbines." The first paper was by Mr. R. M. Neilson. It was read before the Institution of Mechanical Engineers, and was entitled "A Scientific Investigation into the Possibilities of the Gas-Turbine." It will be found in our issue of Oct. 25, 1904, p. 260. The second contribution to which we refer was the presidential address of Mr. Dugald Clerk to the Junior Institution of Engineers, which, under the heading of "The Problem of the Gas-Turbine," was reported in the "JOURNAL" for Nov. 7, 1905, p. 385. We also briefly noticed on Dec. 6, 1904, p. 767, an optimistic article on "The Coming of the Gas-Turbine," which Mr. E. Kilburn-Scott had contributed to the "Electrical Review." Lastly, under the heading "Gas-Turbine Prospects," on Aug. 28 last year, p. 572, we summarized two articles by Dr. C. E. Lucke and Mr. C. M. Garland, which appeared in the then current issue of the "Engineering Magazine." We call these few references to mind, partly because Mr. Neilson rightly said in his paper that, "although many minds seem to he considering it, there appears to be hardly any literature on the subject, except what is found in patent records;" and also partly to connect them up, as it were, to the following summaries of further contributions which have since been made by French engineers, who are giving this interesting problem their consideration.

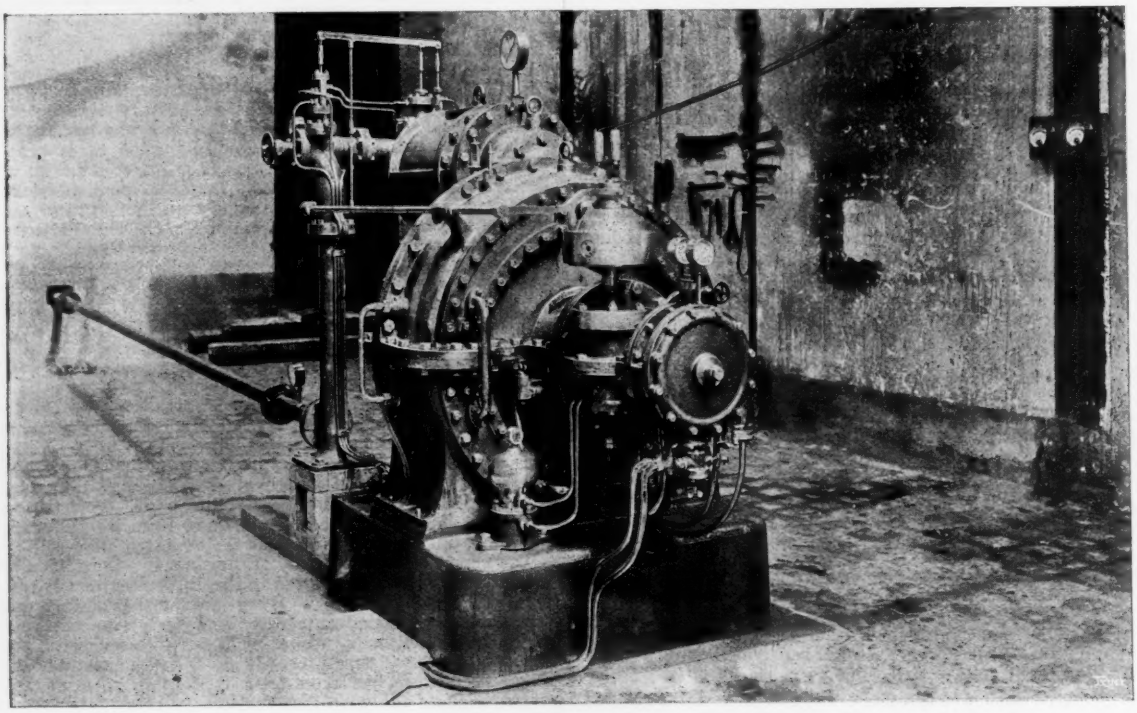
The first is a short article by M. Berthier in "Le Génie Civil," Vol. XLVIII., and summarized in the Institution of Civil Engineers' Minutes, Vol. CLXV. He points out that at first sight it would seem as if the advantages of both the internal combustion engine and of the steam-turbine might easily be realized in a gas-turbine. But he at once proceeds to show the difficulties in the way. The three chief ones are: (1) That of securing proper compression of the gases; (2) that of overcoming the injurious effects of the unavoidable high temperatures; and (3) that of surmounting the difficulty of the serious loss caused by radiation. In the first turbines of this type (which were practically hot-air engines), the cold air was compressed in a separate chamber, and then expanded by exterior heat, after which it impinged on the turbine blades. Later, the practice of the ordinary gas-engine was adopted; and the gas and compressed air were mixed together and burnt continuously—the temperature reached being the excessive one of 1800° C. It may here be called to mind that Mr. Neilson thought that 700° C. was the temperature which the turbine blades could withstand without too rapidly deteriorating; and this view, as we shall see, is not wanting in confirmation. But Mr. Dugald Clerk inclined to a much lower figure than this. In recent turbines, water is used to cool the combustion-chamber; and the steam from it then impinges on the blades—either through a separate jet, or mixed with the gases themselves. M. Berthier emphasizes the importance of the velocity of the gases (or other fluids) acting on the blades in securing efficiency in the working of the turbine. The question of velocity is complicated in the case of gas-turbines by reason of the expansion of the gases. But it is not so in water-turbines, in which the velocity is merely a matter of the difference of pressure between the inlet and outlet. The free expansion of gases has need of being thoroughly studied by physicists to ascertain the precise part played by mechanical and thermic causes conducing, in either co-operation or opposition, to effective velocity. Much remains to be done before the problem of the gas-turbine will be completed solved.

The second paper to which we refer is one by M. Sekutowicz. It was read last year before the Société des Ingénieurs Civils de France, and is to be found in the minutes of their proceedings. It is an able and exhaustive review of the subject; the treatise covering over a hundred pages, and the discussion, to which it gave rise, half as many. Notwithstanding their importance, the views expressed by the French Civil Engineers have not received that attention in the Technical Press generally that might have been expected.

In the first part of his paper, M. Sekutowicz treats of the history of gas-turbines, which he defines as "thermic engines in which heat is transformed into mechanical work by the expansion of a gas mixture acting on the movable organ of a turbine." The first idea of gas-turbines goes back at least to 1847, when M. Burdin proposed to construct a hot-air turbine with multiple wheels; the compression being effected by a series of coupled fans arranged in the same way as the wheels. The experiments with this machine were reported by M. Tournaire to the Académie des Sciences in 1853. The work of many other investigators is mentioned and described.

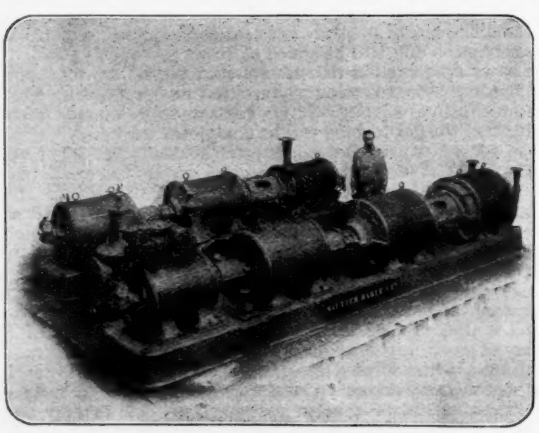
The second part consists of a treatise on the thermo dynamics of gas-turbines; and a critical comparison is made between various possible systems. These are classified according to the method in which the heat is introduced into the cycle. Elaborate theoretical calculations are worked out in each case. To obtain the best cycles, it is necessary to introduce from 375 to 415 calories if without injection, and from 470 to 524 calories if with steam injection, for a combustion pressure of from 30 to 40 atmospheres. Poor gases are less advantageous than rich mixtures (such as coal gas and six volumes of air) for obtaining the best results per 100 calories of heat introduced; for poor mixtures unfavourably influence the mechanical efficiency.

In the third part, the author examines the gas-turbine from the mechanical point of view. Turbines may be axial or radial, with



Combustion Gas-Turbine on the Armengaud and Lemale System.

a single blade or multiple blades. It is impossible to ascertain the mechanical efficiency of gas-turbines, as there are so many contradictory influences at work; but there is every reason to believe that it will not eventually be less than that of the steam-turbine. After considering the important, but neglected, point of the regulation of gas-turbines, M. Sekutowicz passes to the fourth division of his subject, in which he deals with constructional details. To obtain a high efficiency, both thermal and mechanical, the pressure must be as high as possible. The gas should be compressed to 40 atmospheres. Ordinary piston-compressors, rotary compressors, and turbine-compressors are then described. With gas-turbines, the recuperation of heat can be more easily effected, either by gas or by steam, than is the case with explosion engines. The gaseous fuel to be used is next considered. The use of coal-gas or acetylene allows of the adoption of very small compressors; the proportion of the volumes to be compressed being 1 to 8



Four-Section Air Compressor.

and 1 to 20. As to the construction of the movable blades, the author does not anticipate any special difficulty in finding a metal that will withstand the high temperatures to which they will have to be submitted. He gives figures to show what nickel steel has already undergone at 700° C.

In concluding, the author speaks hopefully of the future of the gas-turbine. There are several difficulties to be overcome, and the inconvenience of a compressor apart from the motive organ, though frankly recognized, should not be exaggerated. There will be a great field of usefulness for the gas-turbine in time to come. A bibliographical list of articles dealing with the subject is given at the end of the paper.

In the lengthy and interesting discussion which followed, M. Deschamps thought that explosive turbines, which could work with little or no compression, were superior to turbines with combustion chambers under constant pressure—at least until compressor-turbines gave better results. M. Armengaud referred to the practical work done by the Société des Turbo-Moteurs. He described a combustion-turbine, on the Armengaud and Lemale system, a photograph of which is given. It can supply 300 or 600 I.H.P., according as to whether the turbine receives the whole or only half of the air from the compressor. The number of revolutions per minute is 4000. The combustion chamber is formed by a flue in carbide of silicon placed in a cast-iron sheathing, which is itself enveloped by water or air. The whole explosion operates at once, so that the gases on arriving at the blades are at a sufficiently low temperature. The air required by the turbine is supplied by a poly-cellular compressor of the Rateau and Armengaud system. Each section is composed of a paddle-wheel and a diffuser. Its efficiency is at least 65 per cent., owing to improvement, which consists in cooling the air on its passage in proportion to its compression.

M. Jean Rey also spoke of compressors, for without them the problem of the gas-turbine was unsolvable. A rotary compressor worked by the turbine itself, and placed in a line with its axle, was essential to success. He described a compressor (a photograph of which is given) which was made by Messrs. Sautter, Harté and Co., for the Mines de Béthune. It is formed of four compressor bodies, which enclose 32 blades joined in series. The first body, or section, draws in the air and raises the pressure to 1·7 kilos. or atmospheres; the second reaches 2·9; the third, 4·9; and the fourth gives 7·2 kilos. per square centimetre. The whole compressor requires 400 H.P. to drive it; the speed attained is 4500 revolutions per minute. The average efficiency of the four sections is about 63 per cent. M. Rey did not agree with the author of the paper on some points of gas turbine construction—notably as to the temperature at which blades could work. He thought 427° C. exceeded the limit it was now possible to reach in practical working. The combination of a gas-turbine and a rotary compressor did not at present promise industrial benefit.

Notes to the discussion were contributed by MM. Harté, Letombe, and Bochet; and letters were received from Professor Stodola and M. Jules Deschamps. Thus, the whole paper and discussion form a valuable addition to the literature of the subject of gas-turbines.

Remarkable Efficiency in a Gas-Engine.—According to the "Engineering Notes" in a recent number of the "Daily Telegraph," Professor Burstall, of the Birmingham University, has obtained a record thermal efficiency with the gas-engine which he designed, and upon which he has recently been conducting a series of experiments. It is regarded as fairly certain that when he again appears before the Institution of Mechanical Engineers he will be able to show a thermal efficiency of 42 per cent. In 1892, Professor Capper published some results of a trial on a 7 H.P. gas-engine, of which the thermal efficiency was less than 25 per cent. The engine at the Birmingham University is of much greater power; and with it the scavenging system has been adopted, so that the cylinder is swept clear of all the burnt gases. The above estimate of 42 per cent. is that obtained from the indicator diagram, and not the brake.

THE EARLIEST WORKS ON GAS LIGHTING.

A LIST OF BOOKS, PAMPHLETS, AND IMPORTANT REFERENCES, PRIOR TO THE YEAR 1840.

By F. Southwell Cripps, Assoc.M.Inst.C.E.

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This being the hundredth anniversary of the promotion in London of the first Gas Company in the world, it would seem a fitting opportunity for drawing attention to the earliest writings on coal gas. The writer ventures to think that the following list (compiled from the principal libraries in London) may be of interest to those who desire to trace the early history of coal gas and gas lighting in England, which, as is well known, was not only the first country to use gas for lighting purposes, public or private, but also the first to establish anything at all in the nature of a Gas Company.

In the writer's "Bibliography of Coal Gas," published as an Appendix to the "Transactions" of the Institution of Gas Engineers in 1894, foreign as well as English works were included, and the whole brought up to that year; but in the present instance English writings alone are included, commencing in the Seventeenth Century, and finishing about the year 1840. Several are included which did not appear in the first list; and, moreover, particulars are now given which were then necessarily excluded.

Although the names and addresses of the publishers are now given (in deference to a criticism by the "Journal" on the original work), it is felt that, as nearly all the publishers are no more, and most, if not all, of the works are out of print and difficult to obtain, the publishers' names can be of little service. The writer has, therefore, named the Libraries where the actual works may be seen. In doing this, the Library of the Institution of Gas Engineers is mentioned when a copy may be seen there; but it will be noted that this Library is far from complete. In naming other Libraries, preference is given to those at the British Museum and the Patent Office, as being the most accessible, and containing the larger proportion of the works. Other Libraries consulted, but which contain a very few, were those of the Society of Arts, the London Institution, the City of London, the Institution of Civil Engineers, and the Institution of Mechanical Engineers.

Although the general list stops with the year 1840, the writer has added Clegg's standard work, which first appeared in 1841, and also the two earliest gas periodicals, which appeared in 1847 and 1849 respectively.

The writer would call attention to the extremely interesting and curious matter contained in many of the early works, which would form material for many articles of an interesting character to present-day readers. He has examined practically the whole of the works included in the list, and in most cases added very brief comment—just sufficient to indicate the substance or value of the subject-matter. He is aware that others have referred in their writings to the early history of gas lighting (notably Newbigging, Anderson, Durie, and the earlier authors themselves); but the writer has taken an entirely independent course, and has searched the Libraries and examined the works for himself. A few errors may have crept in; but every effort has been made to render the list as accurate and complete as possible.

In referring to the London Libraries, the following abbreviations are used:—

B.M. denotes British Museum, Great Russell Street, W.C.
P.O. denotes Patent Office Library, Southampton Buildings, Chancery Lane.
L.I. denotes London Institution, Finsbury Circus, E.C.
I.G.E. denotes Institution of Gas Engineers, Victoria Street, Westminster.
S.A. denotes Society of Arts, John Street, Adelphi.

At the conclusion of the list, a short "Diary of Principal Events in the Early History of Gas Lighting" has been appended; also a list of early patents.

A.D.

1667. SHIRLEY (T.) B.M.

A description of a well and earth in Lancashire taking fire by a candle approaching it. Philosophical Transactions, Royal Society, 1667.

Publisher: J. Martin, at The Bell, Temple Bar.

[Earliest account of gas from coal being ignited and experimented with—1659.]

1681. Patents for Inventions, Specifications. P.O.

See "Abridgments of Specifications relating to the Production and Applications of Gas," published by the Patent Office in 1860, 7s.

[About 150 patents in connection with coal-gas were taken out in England alone between the years 1681 and 1840.—see list at end p. 516.]

1726. HALES (Dr. STEPHEN.) B.M.

Experiments with Coal Gas. Vegetable Staticks, Vol. 1.

[Very early experiments on distilling coal.]

1733. LOWTHER (Sir J.) B.M.

An account of the damp air in a coal pit of Sir J. Lowther. Philos. Trans., 1733.

Publisher: Woodward and Davis, Grays Inn Gate, Holborn.

[Describing collection and burning of gas.]

1739. CLAYTON (J.), D.D. B.M.

Experiments concerning the Spirit of Coals in a letter to the Hon. M. Boyle. Printed verbatim in Philos. Trans., 1739, Vol. 41, p. 59. Quoted in "A Journal of Natural Philosophy, Chemistry, and the Arts," commonly known as "Nicholson's Journal," Vol. 16, p. 83.

Publisher: W. Nicholson, Charlotte Street, Bloomsbury.

[Describes actual experiments made in lighting gas at Wigan Coal Pits before the year 1659. A copy of this letter is preserved in a communication from the Bishop of Cork to the Earl of Egremont. See Ascough's MS., No. 4437, in the British Museum.]

1767. BISHOP OF LLANDAFF. B.M., L.I.

Pit Coal: Experiments with Coal Gas. Watson's Chemical Essays, Vol. 2.

Publisher: J. Evans, Paternoster Row, 1789.

[Gives quantities of gas, solids, and liquids in coal by various experimenters, including Dr. Hales (England), Dr. Venel, M. Sage (France), and Prof. Newmann (Germany).]

1800. THIVILLE (COUNT.) B.M., P.O.

An essay on means hitherto employed for lighting streets and interiors of houses and on those which may be substituted to advantage as an attempt towards the improvement of this branch of domestic economy by increasing the effects of light and heat and diminishing its expense.

Publisher: Richardson, Royal Exchange, London. Sm. 8vo.

[Relates to lighting effects (not gas) but of interest as regards fittings, &c.]

1802. HENRY (W.) M.D., F.R.S. B.M.

Account of Murdoch's Experiments, 1792-1802. Thompson's System of Chemistry, Vol. 1.

Publisher: Bell and Bradfute, Edinburgh.

1802. WINSOR (F.A.) B.M.

Description of the Thermo Lamp invented by Lebon, of Paris, in 1786, with remarks.

Publisher: Friedrik Bieweg, Braunschweig, 4to.

[A curious essay printed in three languages, English, French, and German in parallel columns, referring to gas produced from coal and other substances for heating as well as lighting rooms. "Dedicated to His Most Serene Highness Charles William Ferdinand, Duke of Brunswick and Luneburgh, &c., by F. A. Winsor, of London."]

1804. **WINSOR** (F.A.) B.M., S.A., P.O.
Account of the most ingenious . . . National Discovery for some ages, &c. . . . British Imperial Patent Stoves, Ovens, and Utensils for producing Sevenfold Heat and Beautiful Light, Oil, Pitch, Coke, and Pure Inflammable Gaz, without sparks, smoke, soot, or ashes, from which all the accidents of fire arise.
Publisher: Richardson, Royal Exchange, London, 8vo., 2s.
[A long pamphlet setting forth the light and heat-giving advantages of the Patent Stoves, &c.]

1804. **WINSOR** (F. A.) B.M.
The superiority of the new patent coke over the use of coals.
Publisher: Richardson, Royal Exchange, London, 8vo.
[Describing a coke fire as displayed every evening at the large Lyceum Theatre, Strand, and called "The New Improved Patent Light Stove"—a very curious pamphlet.]

1805. **HENRY (W.), M.D., F.R.S.** B.M.
Experiments on the gases obtained by the destructive distillation of pit coal, &c., with a view to the theory of their combustion when employed as sources of artificial light.
Nicholson's Journal, Vol. 11., p. 65.
Sold by T. Stratford, 112, Holborn Hill.
[Excellent early papers.]

1805. **NORTHERN** (J.) B.M.
Experiments on Pit Coal. Monthly Magazine, 1805, Vol. 19.
Publisher: R. Phillips, 6, New Bridge Street, London.
[A letter describing the production of coal gas.]
HENRY (W.), M.D., F.R.S. (*Ibid.*)
[Reply to the above letter, stating that the experiments were not new.]
WRIGHT (G. J.) (*Ibid*).
[Another letter referring to Murdoch's, Dr. Henry's, and Winsor's experiments, and setting forth Murdoch's prior claims.]

1807. **WINSOR** (F. A.) B.M.
Analogy between animal and vegetable life, demonstrating the beneficial application of the Patent Light Stoves to all green and hot houses.
Publisher: Richardson, Royal Exchange, London.
[A lecture given by F. A. Winsor at 97, Pall Mall. The British Museum copy has an inscription in the author's handwriting.]

1807. **WINSOR** (F. A.) B.M., P.O.
To be sanctioned by Act of Parliament: A National Light and Heat Company, for providing our Streets and Houses with Light and Heat on similar principles as they are now supplied with Water; demonstrated, with the Patentee's authority and instructions, by Professor Hardie, at the Theatre of Sciences, Pall Mall, where it is proved by positive experiments and decisive calculations that the destruction of smoke would open unto the Empire of Great Britain new and unparalleled sources of inexhaustible national wealth at this most portentious crisis of Europe. Worth the whole century of inventions of the celebrated Marquis of Worcester.
Publishers: Watts and Bridgwater, 31, South Molton Street, London, 8vo.
[A remarkable pamphlet. The copy in the British Museum contains notes and corrections in Winsor's own handwriting. This pamphlet doubtless did more than anything else to force gas lighting on the attention of the public.]

1807. **NICHOLSON (Dr.)** B.M.
A reply to a correspondent who sends him Winsor's early prospectuses relating to the proposed formation of a Gas Company.
Nicholson's Journal, Vol. 16, p. 73.
[Mentions that Lord Dundonald, years before, lighted gas from coal, and that it was afterwards shown in public by Diller and others. Condemns Winsor and his schemes.]

1807. **WINSOR** (F. A.) B.M.
Dr. W. Nicholson's attack in the Philosophical Journal on Mr. Winsor with Mr. Winsor's defence, with Appendix.
Publisher: Richardson, Royal Exchange, London.
[A reprint of discussion and long letter in his defence by F. A. Winsor.]

1807. **NICHOLSON (Dr.)** B.M.
A few remarks on a pamphlet entitled "Mr. W. Nicholson's attack in his Philosophical Journal on Mr. Winsor and The National Light and Heat Company with Mr. Winsor's defence."
Nicholson's Journal, Vol. 16, p. 308.
[Reply to Winsor.]

1807. **WINSOR** (F.A.) P.O.
Plain questions and answers refuting every possible objection against the beneficial introduction of coke and gas lights.
Publisher: G. Sydney, Northumberland Street, Strand, 12mo., 3d., or 6 for 1s.
[In this pamphlet Mr. Winsor describes himself as "Inventor, Patentee, and Founder of the National Light and Heat Company, 97 and 98, Pall Mall."]

1807. **THOMSOM (THOMAS), M.D.** B.M.
On the inflammable gas found during the distillation of peat.
Nicholson's Journal, Vol. 16, p. 241.
[A long letter dealing with the distillation of peat and gases therefrom.]

1808. **GRANT** (J. L.) B.M.
The Report of J. L. Grant and the other Acting Trustees of the Fund for assisting Mr. Winsor in his experiments.
Publisher: Geo. Woodfall, Paternoster Row, London, 8vo.
[A Petition to the King praying that favour may be shown to Winsor's projects, which after examination they approve. Various replies and reports from Mr. Accum, a chemist, favouring gas lighting. A detailed account of all expenditure to date on the experiments, &c. Very curious.]

1808. **HENRY (W.), M.D., F.R.S.** B.M.
Description of an Apparatus for the Analysis of Gases, with experiments on the gas from coal. Communicated by Humphry Davy, Secretary, Royal Society. Philos. Trans. 1808, p. 282. See also Nicholson's Journal, 1809.

1808. **COOKE (BENJAMIN), F.R.S.** B.M.
On the advantages of employing coal gas for lighting small manufactories and other purposes. Two letters. See Nicholson's Journal, Vol. 21, p. 291 and Vol. 22, p. 145.
[Very excellent letters, quite in advance of the times.]

1808. **WINSOR** (F. A.) P.O.
Hydrocarbon Gas Light.

1808. **MURDOCH** (W.) B.M.
An account of the application of gas from coal to economic purposes. Communicated to the Royal Society by Sir Joseph Banks. See Philos. Transactions, 1808, p. 124; also Nicholson's Journal, Vol. 21, p. 94, with editorial remarks on same.
[Refers to his experiments in 1792 and his practical lighting by gas of Boulton and Watt's factory in 1798. Also published separately as a pamphlet in 1808, and reprinted a few years ago by R. D. Prosser. The reprint may be seen at the P.O.]

1808. **WINSOR** (F. A.) P.O.
Considerations on the nature and objects of the intended Gas Light and Heat Company, published by authority of the Committee.
Printed for J. Ridgeway, Piccadilly, by T. Davies, Whitefriars.
[Setting forth the great advantages of coal gas.]

Tracts Relating to the Gaslight and Coke Company. L.I.

1808. (1) An heroic epistle to Mr. Winsor, the Patentee of the hydro-carbonic gas lights, and founder of the National Light and Heat Company.
B.M., L.I., P.O.
Publisher: R. Spencer, Great Ormond Street, 4to.
[A poem addressed to Winsor. The humorous coloured plates attached to the British Museum and London Institution copies differ. The plates are dated 1807.]

1809. (2) Minutes of proceedings of Shareholders' Meeting 6th July, 1809; containing copy of Deed of Trust, &c.
Publisher: Richardson, 23, Cornhill, 8vo. P.O., L.I.
[J. Van Voorst occupied the chair. A long discussion by disappointed shareholders. Winsor also spoke.]

1809. (3) The speech delivered by Jno. Van Voorst (Member of the Society of Merchants trading to the Continent) before the Proprietors . . . . Meeting held at City of London Tavern, 6th July, 1809.
P.O., L.I.
Publisher: Richardson, 23, Cornhill, 8vo.
[In favour of applying again for an Act of Parliament.]

1809. (4) Minutes of Evidence taken before Committee of the House of Commons relative to Proposed Act. Ordered to be printed, May 19th, 1809.
Publisher: G. Eyre and A. Strahan, sm. folio. L.I.
[The evidence given throws much light on the history of coal gas.]

1809. (5) Speeches of Henry Brougham . . . . before the House of Commons in opposition to the Bill.
Small folio. L.I.
[Printed because the promoters of the Bill had, contrary to precedent, printed the speeches in favour of the Bill.]

1810. (6) An Act for granting certain powers . . . to Company . . . . to be called "The Gas Light and Coke Company" for making inflammable air for the lighting of the streets of the Metropolis, and for producing coke, oil, tar, pitch, asphaltum, ammoniacal liquor, and essential oil from coal; and for other purposes relating thereto. 50vo. Geo. III. Cap. 163. Royal Assent given June 9th, 1810.
Sm. folio. L.I.
[The first Act of Parliament granted a Gas Company.]

1809. **MURDOCH (W.)** B.M., P.O.
A letter to a Member of Parliament from William Murdoch. Replying to a publication by the Commission for conducting through Parliament a Bill for the Gas Light and Coke Company.
Publishers: Galabin and Marchant, Ingram's Court, Fenchurch Street, E.C.
[A vindication of his character and claims.]

1809. ——— B.M.
Gas Lights. Edinburgh Review. Vol. 13 p. 447.
Publishers: A. Constable and Co., Edinburgh.
[A review of three pamphlets on the gas lights—viz.: Murdoch's in Philos. Trans., 1808; Considerations on the intended Gas Light and Heat Company, Ridgeway, 1808; A National Light and Heat Company, with four plates, by Winsor.]

1812. **PRIM (OBIDIAH), M.D.** B.M.
Ludicrous Debates.
Publisher: Chappell, London, 8vo., 1s.

1813. **MALBEN & CO., Perth.** P.O.
Advantages to be derived from the introduction of coal gas into factories and dwelling houses.
Publisher: R. Morrison, Perth, 8vo.

1815. **ACCUM (F. C.)** B.M., P.O., I.G.E.
A Practical Treatise on Gas Light. First Edition.
Publisher: R. Ackermann, 101, Strand, 8vo., 12s.
[The first practical treatise on the subject. Several editions were issued up to 1819.]

1817. **CANDIDUS.** B.M., P.O.
Observations on Gas Light.
Publishers: T. & G. Underwood, 32, Fleet Street, 8vo., 2s.
[Calling attention to the necessity for properly purifying gas to safeguard the public from injury to health.]

1819. **CONGREVE (SIR WILLIAM).** B.M., P.O.
Saving of fuel in the generation of gas.
Publisher: T. Egerton, Military Library, Whitehall, 8vo.
[Heating retorts in Dover Street Gas-Works by adding chalk to fuel, &c.]

1819. **PECKSTON (T. S.)** B.M.
Theory and Practice of Gas Lighting. First Edition.
Publishers: T. and G. Underwood, 32, Fleet Street, E.C. 8vo, 21s.
[A general treatise on the subject. The second edition was published in 1823.]

1819. **PECKSTON (T. S.)** B.M.
Cursory observations on different processes for the distillation of coal, &c.
[Giving estimates of cost of apparatus and of entire gas-works, and also probable results from working the apparatus.]

1819. **HENRY (W.), M.D., F.R.S.** B.M.
Experiments on gas from coal.
Publisher: S. Russell, Deansgate, Manchester. 8vo.
[Reprint from the memoirs of the Literary and Philosophical Society of Manchester, Vol. 3.]

1819. **ACCUM (F. C.)** B.M., P.O., I.G.E.
Description of the Process of Manufacturing Coal Gas.
Publisher: Thomas Boys, 7, Ludgate Hill. 15s.
[Illustrations show great advance in apparatus since his first book. Another edition appeared in 1820.]

1820. **CECIL (Rev. W.)** P.O.
On the application of hydrogen gas to produce a moving power in machinery. A description of an engine which is moved by the pressure of the atmosphere upon a vacuum caused by explosions of hydrogen gas and atmospheric air. Cambridge Philosophical Society's Transactions, 1820. Vol. 1, pp. 217-39.

1823. ———
Observations on Gas Explosions.

1824. **DIRECTORS.** B.M.
Independent Gas Light and Coke Company—Prospectus dated 7th October, 1824.
London. Folio.

1824. ——— I.G.E.
London and Westminster Oil Gas Bill.—Evidence before House of Commons.
Publisher: Government Printers.

1825. **AN OLD PROPRIETOR.** B.M, P.O.
Address to the Shareholders of the Gas Light and Coke Company.
Publishers: C. and J. Rivington, St. Paul's Churchyard. 8vo.

1825. **DIRECTORS.** B.M.
Independent Gas Light and Coke Company. Conditions to be observed by persons taking gas of this Company.
London. Folio.

1825. **DIRECTORS.** B.M.
United Kingdom Gas Light and Coke Company—Prospectus.

1825. **DIRECTORS.** B.M.
United General Gas Company—Prospectus.

1827. **MATTHEWS (W.)** B.M.
A Compendium of Gas Lighting adapted for those unacquainted with Chemistry. First Edition.
Publisher: Rowland Hunter, 72, St. Paul's Churchyard. 12mo.
[Describes the manufacture of oil gas as well as of coal gas.]

1827. **THOMPSON (T.)** B.M.
On a new combustible gas.

1827. **MATTHEWS (W.)** B.M., P.O., I.G.E.
Historical sketch of the origin, progress, and present state of gas lighting.
Publisher: Rowland Hunter, 72, St. Paul's Churchyard. 12mo. 7s.
[An important work, of about 350 pages.]

1827. ——— B.M.
History of Gas Lighting.
London Magazine, Vol. 9, page 502.
Publishers: Hunt and Clarke, York Street, Covent Garden.
[A review of Matthews' historical sketch of gas lighting, &c. A very full account.]

1828. **HEDLEY (J.)** P.O.
Gas Supply to the City of London—Letter to Lord Mayor.
Publisher: J. M. Richardson, 23, Cornhill. 8vo.

1829. ——— B.M.
Gas Light. Westminster Review. Vol. XI., p. 292.
Publisher: R. Howard, 2, Wellington Street, Strand.
[Review on Matthews' historical sketch of the "Origin, Progress, and Present State of Gas Lighting, 1827," and strongly advocating Murdoch's claim to be the true, practical inventor of gas lighting. Giving excellent summary of history.]

1832. **WITTY (R.)** P.O.
Gas Furnace (see also Patent Specifications), 1826-5427 and 1828-5663.
Publisher: — Chanter, Park Cottage, King's Road, Chelsea, 12mo.

1832. **RUTTER (J. O. N.)** B.M., I.G.E.
Practical Observations on Gas Lighting.
Publisher: Longman and Co., 1s.

1834. ——— B.M.
History of Gas. Penny Magazine of the Society for the Diffusion of Useful Knowledge. Vol. III., pp. 373-492.
Publisher: Charles Knight, 22, Ludgate Circus.
[A good account of the history of coal-gas, also oil-gas.]

1839. **POLE (W.), F.R.S.S., Lond. & Edin.** B.M.
Rule for Ascertaining the Pressure of Gasholders of Different Dimensions.
Mechanics Magazine, Vol. 31.
Publisher: W. A. Robertson, Fleet Street.
[A clear and complete treatment of this subject. Allows for immersion of gasholder, buoyancy of gas, &c.]

1839. **BECK (J.)** B.M.
Lighting Gas Lamps by Electricity.
Mechanic's Magazine, Vol. 30.
[Letter describing device, illustrated.]

1840. **PARKER (J. W.)** B.M.
Hints to Gas Consumers, 12mo, 1s. 6d. and 2s.

1841. **CLEGG (S.)** B.M., I.G.E.
Manufacture and Distribution of Coal Gas. First Edition.
Publisher: John Weale, 59, High Holborn, folio.
[For some years the standard work on gas manufacture. Revised editions printed 1841, 1853, 1859, 1866.]

1841. **PECKSTON (T. S.)** B.M.
A Practical Treatise on Gas Lighting.
Publisher: — Herbert, Cheapside.
[A very much enlarged edition of his former work.]

EARLY PERIODICALS.

B.M.
1832. **"The Gasometer,"** or Dunfermline Literary Magazine (January to December), title afterwards altered to "The Monthly Scrapbook."
Publisher: John Miller, Dunfermline, 12mo.
[Makes no reference to gas whatever, but is curious on account of its title.]

B.M.
1847. **"Gas Gazette,"** and "Monthly Advertiser," from 10th May to 11th October, 6d.; "Gas Gazette," or "The Monthly Gas Circular and Advertiser," 10th November, 4d.
Publishers: Prettyman and Rixon, 29, Poultry, London.
[Probably the only copies in existence are those in the British Museum. All these bear the autograph of the proprietor, Mr. George Barlow. This paper is remarkable as being the first periodical published which was solely devoted to the gas industry. It had a brief and struggling existence, the appeals of the proprietor for support were of no avail, so after six months a change of Editors took place; the title was slightly altered and the price reduced, but it only survived one month longer. In 1849 the present "JOURNAL OF GAS LIGHTING," was started, but with what a different result!]

1849. **"Journal of Gas Lighting."** B.M., I.G.E.
Publisher: Thos. Greaves Barlow; 32, Bucklersbury, E.C. Published quarterly, with an intermediate supplement on the 10th of each intervening month. (Since 1874 published weekly. Present Publisher: Walter King, 11, Bolt Court, Fleet Street, London.)
[The early volumes are scarce, particularly the first. Even the Patent Office Library does not possess the first volume.]

DIARY OF PRINCIPAL EVENTS IN THE EARLY HISTORY OF GAS LIGHTING.

A.D.	
1667	Thomas Shirley in 1659 discovers "burning spring" at Wigan.
Before 1691	Rev. J. Clayton (Dean of Kildare) experiments with coal-gas.
1726	Dr. Stephen Hale distils coal, determines quantity of gas, &c.
1733	Sir Jas. Lowther experiments with gas at a colliery near Whitehaven.
Before 1767	Bishop of Llandaff experiments with coal-gas.
1775	Dr. Venel analyses coal.
1778	M. Sage analyses coal.
1784	Minkeliers experiments with gas for inflating balloons.
1785	Lord Dundonald obtains Act for the making of different substances from coal—he experimented in 1780.
1786	Lebon invents "Thermo Lamp."
1787	Lord Dundonald lights the hall of Culross Abbey with crude coal-gas.
1792	Murdoch experiments and lights house and offices in Redruth.
1797	Murdoch publicly exhibits gas lighting at Old Cumnock, Ayrshire.
1798	Murdoch lights Boulton and Watts' factory in Soho, Birmingham.
1799	Lebon patents gas-engine worked by coal-gas.
1801	Lampadeus suggests lighting town with gas.
1802	Lebon lights house in Paris with wood and coal gas, and suggests lighting Paris generally.
1802	Murdoch illuminates front of Soho factory.
1803	Winsor illuminates Lyceum Theatre.
1804	Winsor takes out patent for manufacturing and purifying coal-gas.
1804	Murdoch lights up Lee's house.
1805-6	Murdoch lights Phillips and Lee's factory at Salford with about 1000 burners.
1807	Winsor lights up Pall Mall and **promotes the National Light and Heat Company,** afterwards called the Gas Light and Coke Company.
1808	Murdoch receives Royal Society's Gold Medal for account of his inventions in gas lighting, &c.
1809	Application of National Light and Heat Company to Parliament for Bill (refused, as opposed by Murdoch).
1810	Act of Parliament granted to Gaslight and Coke Company.
1813	Westminster Bridge first lighted.
1814	Westminster lighted.
1816	London generally lighted.

LIST OF PATENTS
RELATING TO
GAS MANUFACTURE, APPARATUS, FITTINGS, &c.

1789 No. 1689; **1791** Nos. 1832, 1833; **1792** Nos. 1861, 1928; **1794** No. 1983; **1796** No. 1979; **1804** No. 2764 **1806** No. 2941; **1808** No. 3113; **1809** No. 3200; **1810** Nos. 3323, 3325, 3333; **1815** No. 3968; **1816** Nos. 4029, 4035, 4046; **1817** Nos. 4100, 4106, 4122, 4139, 4142, 4154, 4184, 4188; **1818** Nos. 4199, 4283, 4306; **1819** Nos. 4341, 4351, 4365, 4381, 4405, 4409; **1820** Nos. 4458, 4483, 4516; **1821** No. 4587; **1823** Nos. 4790, 4808, 4830, 4832; **1824** Nos. 4893, 4940, 4954, 4975, 4977, 4978, 4982, 5054; **1825** Nos. 5089, 5131, 5133, 5146, 5152, 5173, 5178; **1827** Nos. 5454, 5465, 5471, 5541, 5563; **1828** Nos. 5624, 5663, 5712; **1829** Nos. 5771, 5784, 5807, 5860; **1830** Nos. 5900, 5926, 5966, 6003, 6020; **1831** Nos. 6123, 6174, 6179; **1832** Nos. 6276, 6333; **1833** Nos. 6381, 6398, 6486, 6487; **1834** No. 6680; **1835** Nos. 6799, 6810, 6838, 6844, 6868, 6884, 6941; **1836** Nos. 7023, 7024, 7129, 7151, 7215, 7221, 7243; **1837** Nos. 7294, 7296, 7358, 7387, 7447, 7454, 7460, 7504; **1838** Nos. 7536, 7560, 7581, 7625, 7632, 7674, 7675, 7705, 7734, 7748, 7751, 7788, 7868; **1839** Nos. 7939, 7996, 8062, 8098, 8125, 8126, 8141, 8154, 8167, 8253, 8298, 8314; **1840** Nos. 8393, 8446, 8486, 8487, 8509, 8535, 8577, 8621, 8624, 8728, 8739, 8752, 8754.

THE TEMPERLEY COAL-HANDLING PLANT AT THE NEW GAS-WORKS AT POOLE.

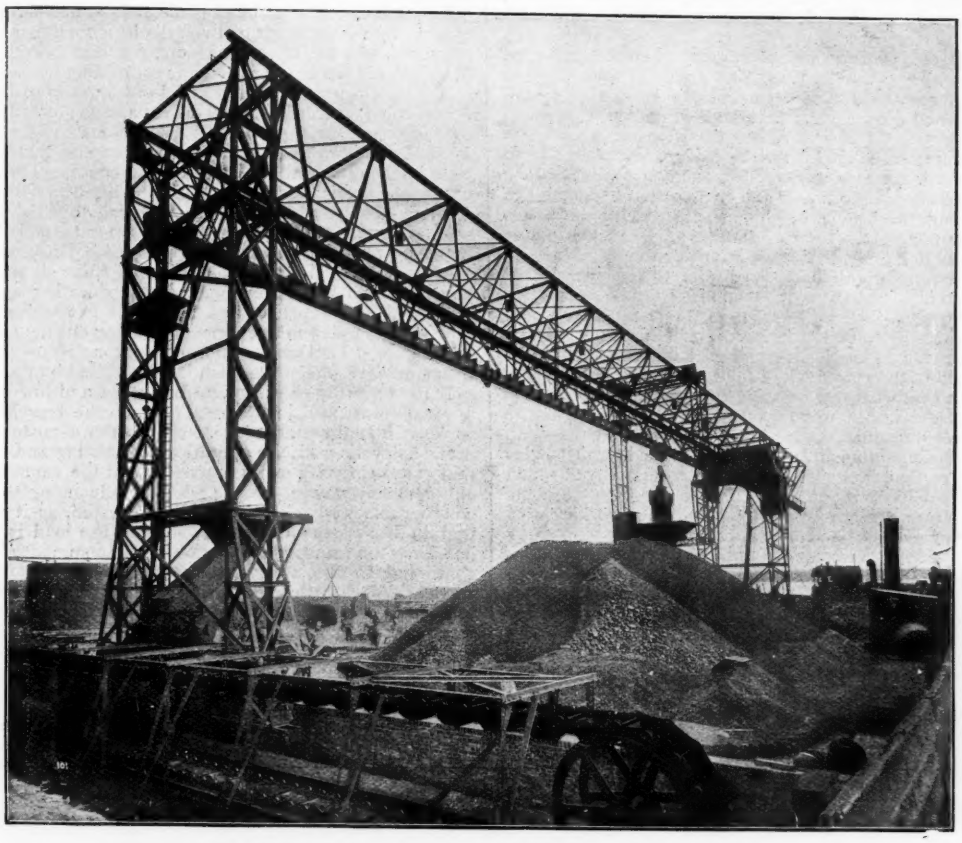


Fig. 1.—Temperley Grab Transporter at the New Gas-Works at Poole.

It will doubtless be remembered that in the course of Mr. Harold W. Woodall's Inaugural Address at the annual meeting of the Southern District Association, a few weeks ago, he referred to the coal-handling plant which the Temperley Transporter Company had erected at the new works of the Bournemouth Gas and Water Company at Poole; and diagrams of the transporter were given in the "Journal" for March 26 (p. 807). As the members of the Association will be visiting the works on the 30th inst., some particulars of the plant, supplementary to those given by Mr. Woodall, may be of interest. These we are in a position to furnish from an article which appeared in a recent number of the "Iron and Coal Trades Review," to the courtesy of the conductors of which publication we are indebted for the loan of the blocks to illustrate the description.

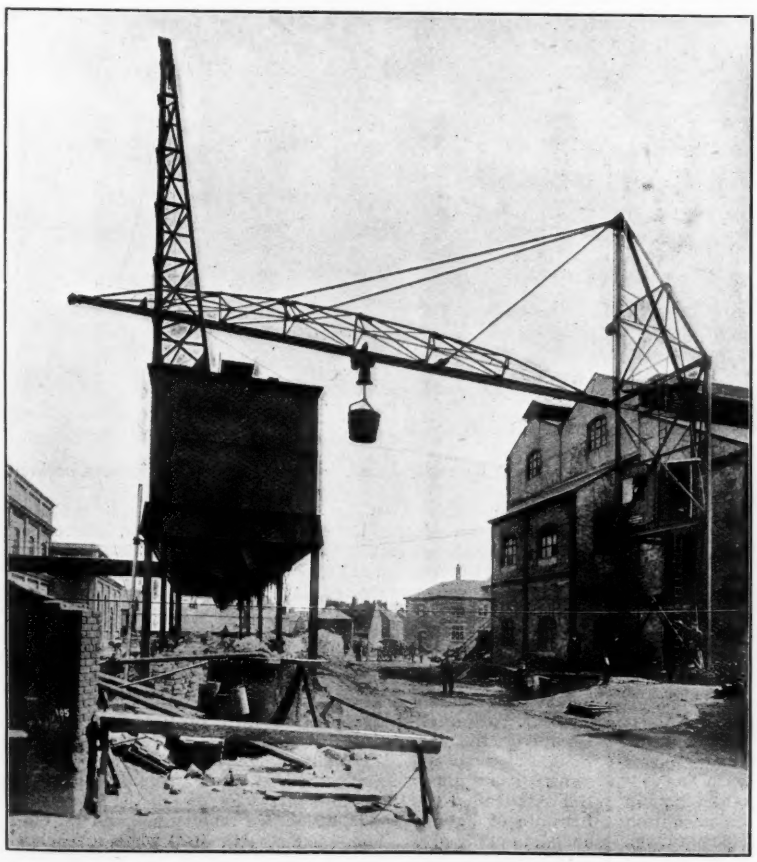


Fig. 2.—Temperley Radial Transporter at the New Gas-Works at Poole.

The plant was designed for discharging coal in bulk from vessels and from railway trucks by means of grabs, and delivering it on to any part of a large storage-ground, or on to a gravity-bucket conveyor, which conveys it to the coal-bunkers in the retort-house, as well as for lifting the coal again from the stock heap and delivering it to the conveyor. The structure, which is illustrated in fig. 1, is in the form of a bridge with a clear span of 180 feet between the supporting frames, reaching across the whole storage-ground, and with a cantilever extension of 92 ft. 6 in. extending over the quay and a public road. The portion of the cantilever overhanging the water is made to hinge up so as not to obstruct the water-way. The general form of the transporter beam is that of a lattice girder of triangular cross section, with the apex downwards, having two upper booms and one bottom boom—the latter forming the track on which the traveller runs. By this arrangement, the whole of the material in the girder is effectively utilized for supporting its own weight and that of the load, as well as the stresses due to wind pressure. The economy of this form compared with the usual rectangular form is apparent, as in the latter there must always be two upper and two bottom booms, a great number of heavy cross-bearers, and the track itself—no fewer than five main longitudinal members in place of only three. In the present installation, the superstructure is rigidly built into, and incorporated with, the supporting frames. These are tapered

downwards to leave the full width of the ground available for stacking the coal. The front, or waterside, frame carries the whole of the hoisting and transporting machinery in a closed-in house, and also the driver's cabin, in an elevated position, from which the man who controls all the operations of the transporter has a full and perfect view of everything. The back, or in-shore, frame carries a coal-crusher, with a hopper and conveyor feeder, through which all the coal is passed as it goes to the conveyor. The whole transporter is mounted upon wheels running on rail tracks under each supporting frame and extending the whole length of the storage-ground. A hopper weighing-machine is carried on a frame suspended from the bridge, and arranged to be readily moved along to any position thereon over the stock heap, or to a position directly over the coal-crusher hopper. The movement along the bridge, combined with that of the whole transporter on its tracks, allows of the weighing-machine being placed over any point on the storage-ground.

When it is required to discharge coal from a vessel, the transporter is moved along into a position opposite a hatchway; and the hinged arm need not be lowered, as the transporter works equally well with the arm in the raised position. The gravity-bucket conveyor is laid along near the ground outside, and for the whole length of the rear track of the transporter, and parallel to the track, so that whatever position the transporter happens to be in it can always deliver coal on to the conveyor, whether from vessel, truck, or stock heap. The conveyor is carried up vertically to a sufficient height, and then extended at right angles to its former direction, over the retort-hoppers, into any of which it automatically delivers the coal.

Although the transporter is specially adapted for working with a grab, this can readily be removed, and turn-over skips may then be used. A special automatic fall-block and skips have been provided; but they are being seldom used, as experience goes to show that, under nearly all conditions that obtain, the grab gives better and more economical results. Whether grabs or skips are used, the operator, by means of the same machinery, can at will discharge the coal under any part of the transporter, and at any height. Electric lights over the transporter bridge and cantilever illuminate the site during night operations.

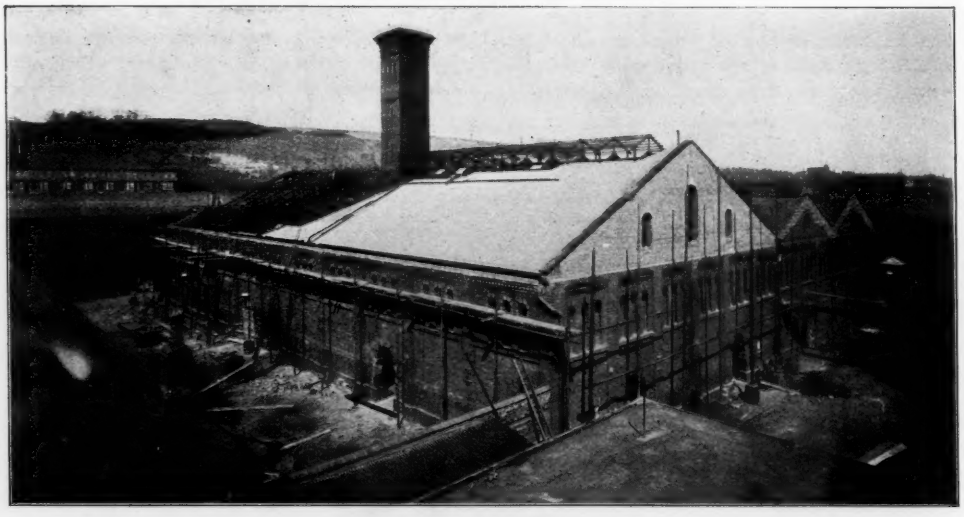
In order to facilitate the working at night and in foggy weather, a special indicator, which is practically a reduced model of the transporter, is fitted in view of the driver. On this the traveller, grab, and weighing-machine move automatically in harmony with the actual parts they represent—thus enabling the driver to operate the transporter without seeing the actual operations. The whole of the machinery is electrically driven. The current is picked up from a pair of live rails in a conduit parallel to the conveyor, and the main runs along the bridge to the machinery house on the top of the water-side supporting frame.

A double-drum winch lifts and lowers the grab by two ropes, one from each drum. These drums are connected by a special epicyclic gear arranged so that both drums can be run together to lift and lower the grab, or one drum can be held by a brake to support the grab while the other drum operates the opening and closing mechanism. The grab can be lifted and lowered either open or closed, and can be fully or partially opened at any height as quickly or as slowly as desired. A separate single-drum winch, by means of two ropes wound in opposite directions, hauls the traveller along the transporter beam in either direction. While this operation is progressing, the compensating epicyclic gear in the hoisting winch causes its drums to revolve in opposite directions, hauling in one rope and paying out the other, so as to maintain the load at a uniform height as it moves along the beam, unless its height is intentionally varied by the driver.

If the operator so wishes, he can raise and lower the load at any required speed just as readily when the traveller is moving as when it is at rest, because, owing to the compensating action of the epicyclic gear, the operations of hoisting and lowering and that of transporting can be carried on at the same time without either in any way interfering with or influencing the other. A considerable saving of time is thus effected, as it will be seen that, in discharging a vessel, as soon as the load is clear of the hatchway the transporting motion can be commenced. The load, continuing to rise, attains its fully-desired elevation before the traveller reaches the end of its journey. Conversely, lowering can be commenced before the traveller arrives again over the hatchway—that is to say, the load can be moved along any desired trajectory and at any speeds at the will of the operator.

In fig. 2 is shown a radial transporter which the Temperley Company have also installed at these works for the purpose of conveniently delivering coke from the retort-house into the storage hoppers.

NEW RETORT-HOUSE ROOF AT SCARBOROUGH.



New Retort-House Roof at Scarborough.

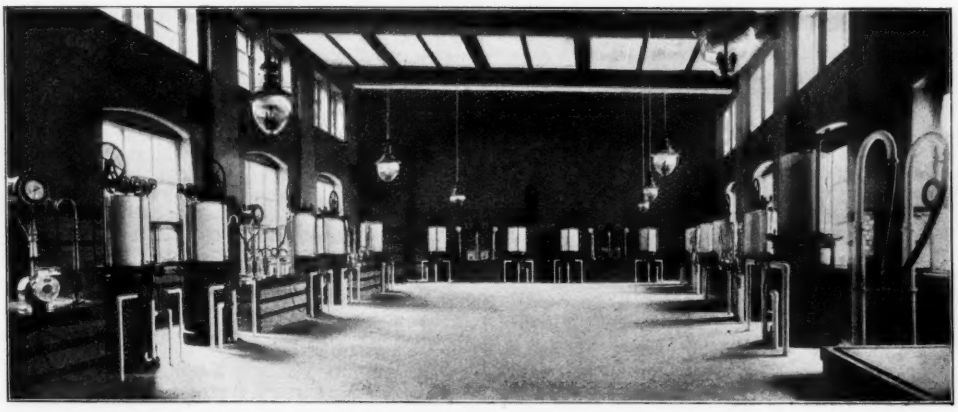
The accompanying photograph illustrates the new retort-house roof just erected for the Scarborough Gas Company, which takes the place of the old double-span wooden roofs, exactly similar to those shown, erected about 34 years ago. These old roofs consisted practically entirely of pitch-pine timber, and had got into a dilapidated and unsafe condition, causing Mr. Alexander Allan, the Company's Engineer, to decide to replace them by a single span roof. He determined not to discard or do away with the centre girder, which up to then had practically carried one-half the weight of the double roofs; it being deemed advisable to retain this support, owing to the strength and condition of the outer walls of the retort-house being on the light side.

A roof was, therefore, designed which was calculated not to put any more weight on the outer walls of the building than hitherto, by carrying the apex of the new single-span roof by means of rolled steel joist king-posts from the existing girders. The roof in all is 60 ft. 2 in. span, with a total length of 140 ft. 3 in., and is covered with Duchess slate double-nailed to the angle-iron laths. The slating so fixed will, it is anticipated, be strong enough to withstand any gale; it having been already severely tested by those recently experienced, when not a single slate was broken or displaced.

The photograph shows the position of the work 18 days after the Contractors (Messrs. Robert Dempster and Sons, Limited, of Elland) commenced to dismantle the old roof, and at the same time started the erection of the new one. The whole of the iron-work was erected twenty-one days after starting to dismantle; and the slating was finished six days later. The entire job was carried out without inconvenience to the stokers working underneath, with no mishap, and to the satisfaction of everyone.

We have received a print of a paper by Mr. Oliver Imray and Mr. Arthur G. Bloxam (of the firm of Messrs. Abel and Imray) on the application to the chemical industry of Great Britain of the proposed legislation in regard to patents and designs. The authors' observations on the Patents and Designs Bill practically repeat the views of the Fellows of the Chartered Institute of Patent Agents, which, we understand, will be embodied in many of the amendments to the Bill when it reaches the Committee stage.

MANCHESTER METER-TESTING STATION.

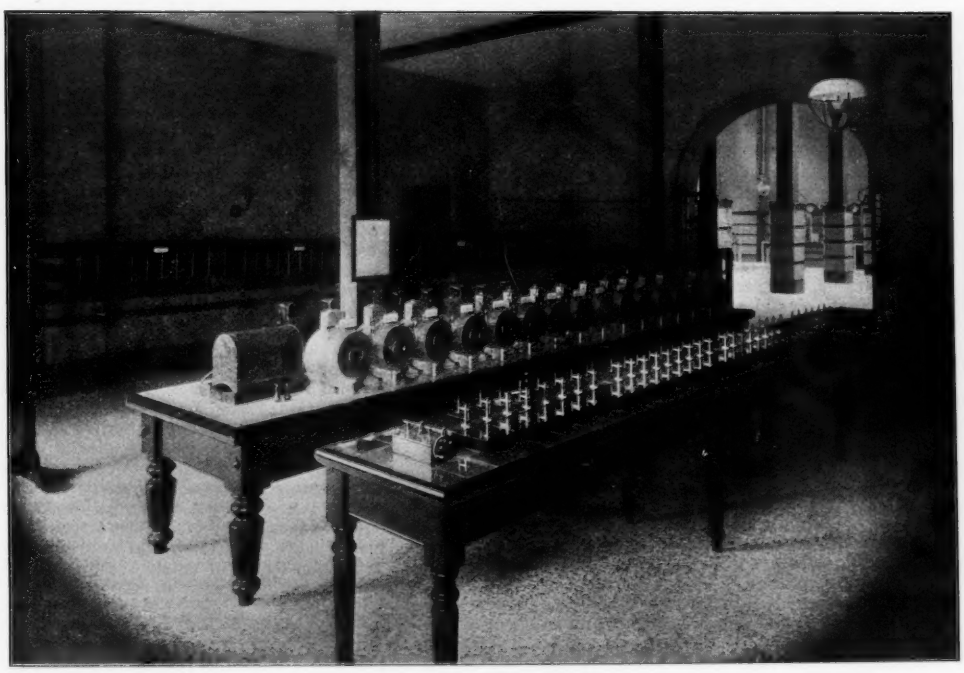


The Chief Meter-Testing Room.

In last week's "Journal" (p. 473), some extracts were given from the recently issued report of Mr. S. Dyson, the Official Inspector of Gas-Meters at Manchester, in which it was stated that during the past year the staff had been busy with the removal of the apparatus to the new testing-station at London Road, which is now occupied by the department, and which will provide accommodation for many years to come. We are to-day able to reproduce two photographs, which show the ample nature of the provision that has been made. The offices are, Mr. Dyson says in his report, considered to be the best equipped in the kingdom; and they are provided with the most modern and latest instruments for gas-meter testing. The heating apparatus is well suited for readily adjusting the temperature of the air in the room, and the water, for testing operations; and there has been introduced an efficient steam-pipe connection to each of the test holders for maintaining the required temperature of the water.

The chief testing-room (which is illustrated in the first photograph) contains fifteen standard test holders and the necessary appliances. It is well lighted, very spacious, and lofty. In this room there is a hydraulic lift for dealing with large meters, before and after testing. There are seven testing-tables composed of granite slabs 6 feet long by 4 feet wide and 6 inches thick, each supported on glazed brick piers. The tables are fitted with pillars for gas, air, and water supplies. The waste gas and air from the old meters during the testing operations are extracted from the room by a fan driven by an electric motor.

As was stated last week, the "double test" has been adopted in Manchester; and one room (shown in the second illustration) is used entirely for testing indexes of wet meters belonging to the Corporation. The additional work required for this test is carried out by mutual agreement between the Corporation Gas Committee and the Justices' Committee—there being in the Sale of Gas Act no statutory powers for this work. There is another room which is used for testing indexes of dry meters. There is also a Committee-room, an office for the Inspector, a meter store-room, and a mess-room for the assistants.



The Wet-Meter Index-Testing Room.

GAS CONSUMERS' COMPLAINTS.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

Whether any advantage has accrued to the ratepayers of Nottingham from the recent inquiry respecting the gas undertaking there, as reported in the columns of the "Journal," is a matter upon which I do not propose to offer an opinion. It has been the medium, however, of furnishing some interesting and instructive information to those who, with the aid of personal experience in administration of gas undertakings, and in attending on a governing Committee, are able to read in between the lines of the evidence taken. The object now in view is to offer a few remarks as to the best methods of dealing with complaints, in view of the diverse opinions expressed. The Engineer was in favour of a competent system for the registration of complaints, by officials sufficiently versed in gas matters to make a preliminary investigation and classification; but the City Accountant considered that no benefit would follow such an innovation, and that it was sufficient for any copying clerk to take down the substance of the communication on a card and pass it over to the

workshops. While the Gas Engineer pressed strongly for technical investigation at the outset, the Accountant rejected anything of the sort. The complaint department is usually considered to come within the scope of the Manager's, rather than of the Secretary's duties; being more nearly related to technicalities than to finance. Apart from error or negligence such as is not likely to obtain in any properly-managed concern, it does not touch upon the Accountant's department; and if complaints are registered for reference, there is good reason for proper classification. In comparing the complaints received during one year with those of another, it is necessary to consider the method by which they are recorded; and as considerable interest in the matter has been taken by gas managers, and in most gas-works a more or less systematic attempt at registration and investigation is made, the consideration of such a homely subject is not out of place.

The expression "a complaint," in gas office parlance, is an indefinite term covering a very wide area; and broadly it is an expression of dissatisfaction. It may be anything from a real grievance to pure ignorance or personal spite. There may be a disagreeable odour indicative of escaping gas. Formerly the difficulty was that people would not take sufficient interest in preventing escapes; but now, thanks to the efforts of electricians, the pendulum has swung too far the other way, and the slightest smell of gas is supposed to involve risk of destruction of the premises, or of a death in the family, and some judgment is required in the correct diagnosis of a complaint couched in general terms such as "bad" or "fearful." The pressure may be weak and variable at times; and incandescent lights have an unpleasant knack of calling prompt attention to the slightest deficiency of pressure. The annoyance caused by weak or unsteady lights is nothing to that which follows if the family joint is not properly "done." The bad light is soon disposed of; but it is not so easy to get rid of the gentleman who has just risen from an insufficiently cooked luncheon or dinner. Complaints due to deficiency in quality or purity are now rarely met with, as in most districts the arrangements at the works are such as to ensure the maintenance of the standard illuminating power and of freedom from sulphuretted hydrogen, from one year's end to another. From the consumer's point of view, no doubt, the existence of a cause for complaint is positive evidence that the suppliers are at fault; but this is not the case as a matter of fact. For every instance that can be fairly brought home to them, there are several that can be laid at the doors of the consumer. There is the fancy grievance, such as when a complaint is laid of a "large escape" of gas, because the bill happens to run to some shillings more as compared with the corresponding quarter in the previous year. There is also the frequently occurring trouble due to the addition of light after light, or stove after stove, in the course of years, till the original capacity of the service and meter is far outstripped, and the consumer is endeavouring at times to get 300 to 400 cubic feet of gas per hour through an appliance intended to supply about 50. Not less frequent are the troubles due to neglect of the burners, which are not cleaned or otherwise kept in order until their efficiency is at an end.

The existence of cause for complaint is a matter that will be regretted by all concerned; and both supplier and consumer are equally interested in arriving at the cause and at the remedy. The consumer does not want to suffer loss or inconvenience; and the supplier does not want gas to get a bad name. But to this end there must be reasonableness, and perhaps forbearance, on both sides. The suppliers of gas should spare no pains in bringing every complaint to a proper conclusion; but the consumer should not put in an appearance at the gas office without sufficient reason. If gas is to be sold at the lowest reasonable price, the office expenses must not be unnecessarily extended by wasting the time of officials and employees ever matters that do not concern them. While the consumer should feel that any real cause of offence will receive prompt and adequate attention, he should not be encouraged in the belief that a staff of men are waiting at the works for a summons to clear an incandescent burner, wipe out the oven of a cooker, or such like matters that are more closely connected with the ordinary household routine than with the responsibilities of the gas company. The complaint as concerning the gas company is a modern growth. There was a time when such a thing did not enter into gas-works politics, and the consumer knew it was no use to go to the gas office but called in a gasfitter or plumber at his own expense. Since, however, gas companies have adopted an obliging disposition, and laid themselves out to help their customers in every possible way, there is certainly a tendency to put them to unnecessary expense and trouble in remedying matters for which they are not in any sense responsible.

The act of accepting a complaint at the gas office carries with it a certain amount of responsibility. The consumer naturally imagines that he has handed over any obligations in respect to the matter on his part, and that any loss or inconvenience due to the continuance of the defect, although it may be entirely due to his negligence and ignorance, is chargeable to the company. And when it is known that all complaints are attended to *gratis*, the clerk at the complaint desk is not likely to have an idle time. No complaint, once accepted, should be neglected, however absurd or unreasonable. This fact of itself is sufficient cause for the taking of complaints by some person competent to say at once whether the suppliers are responsible or not. Sometimes there will be uncertainty, in which case, of course, it will be wise to give the customer the benefit of the doubt. If the suppliers are prepared to accept full responsibility for anything and everything up to the burners, the competent complaint agent may not be needed. But even in that case it would be an advantage to have a proper classification of complaints. There is some risk that serious trouble or difficulty may be overlooked amidst a crowd of trifles. The mere copyist passes on all complaints as received; but the qualified clerk will quickly perceive—perhaps from the nature of one complaint, perhaps by means of several coming in from one street or district—that there is something calling for the immediate attention of the manager or chief distribution inspector. When the complaint is simply booked without inquiry, decision upon this point is thrown upon the workman sent to attend to it, and may involve a degree of responsibility that the average citizen cannot be expected to accept. Every complaint, legitimate or otherwise, should receive attention; and any question that the consumer may ask should be answered. If the suppliers are going to do anything, he can be told as definitely as may be practicable what is proposed to be done; and if the complaint is rejected, the reason for such rejection should be courteously but firmly set forth.

Frequently the notice of a complaint is tendered in such ambiguous or general terms that a preliminary visit to the premises is desirable to find out what is really wanted. The average errand boy, servant, or messenger is not given to preciseness; and, if he is merely repeating a message in reference to a matter about which he has no personal knowledge, he is rather prone to add touches of a sensational rather than a helpful character. But an experienced officer can in most cases read between the lines and give instructions as to what is required, thus saving delay and risk. There is also the question of responsibility. The law is very strict on suppliers of gas in the matter of prompt attention to complaints due to leakage. If it does not hold that they are bound to keep the whole of the mains and services perfectly gas tight, there is little sympathy if an accident happens after notice has been sent to the gas office, however irregular and indefinite such notification may happen to be.

There has been some talk lately about the necessity for improving the gas-works and office staff. One class for individual that can with advantage to all concerned be improved out of existence is the mere mechanical copyist or human graphophone. From the complaint desk, throughout the workshops and the entire staff, each individual should be encouraged to rise to the dignity of ordinary intelligence and reason. And in no department is the necessity for this characteristic more marked than among the collectors, inspectors, and workmen who come in actual contact with the customers. The clerks at the office, the collectors, under-inspectors, and workmen sent to attend to complaints or to fix apparatus on hire, represent the "company" to 19 out of every 20 customers; and progressive managers will take care that the representation is a creditable one. Tact, intelligence, and judgment will go a long way towards smoothing away causes of complaint. The mere fact that large numbers of complaints are received is of itself an indication that there is "Something rotten in the state of Denmark," and that the existing system may with advantage be examined.

It may be worth while as a matter of general interest to tabulate every complaint; but for all purposes connected with the administration of the concern—such as regulation of supply pressure, alterations, and additions to the mains from time to time to keep pace with increased demands—only the legitimate ones that are actually within the province and control of the company need be considered. In districts where the conditions are altering by the addition of new consumers, or by the increased use of stoves or appliances, a properly kept complaint book is of great value, though it cannot replace the positive evidence afforded by the diagrams of a portable registering gauge. Such an alteration as the introduction of incandescent burners in the place of flat-flames may necessitate some revision of the pressures at the governors. In the old days when gas cost 5s. or 6s. per 1000 cubic feet, a low pressure was not objected to provided the bill was also low. But the modern consumer rarely troubles about the bill, and demands at least double the pressure. "Give me good gas and plenty of it," he says in effect. A few extra tenths on the supply pressure at the time of maximum demand will go a great way towards reducing the entries in the complaint book.

COAL AS FUEL FOR FIRING RETORT-SETTINGS.

At the Annual Meeting of the Illinois Gas Association, a paper on this subject was read by Mr. W. R. Rhoades, the Superintendent of the Springfield (Ill.) Gas Company. The following are some extracts from the paper.

Assuming that the item of labour in the retort-house has been brought to the best working basis, the subject of next importance, or possibly even of the first importance, is that of bench fuel—the results that can be obtained from each of the various substances used, and their comparative cost. This is a many-sided question changing with local conditions, and largely controlled by the relative cost of material in present use and the substitute we wish to try. Of course, the one giving the best results at the least cost is the most economical; and therefore it becomes a question of results based upon individual experiences as to which may be

considered best. Of the four—coke, gas coal, tar, and the ordinary bituminous coal from native fields—coke seems to be the fuel most commonly used. This is probably because of the ease with which the stoker can supply himself with fuel; perhaps on account of poor results obtained from coal, or because it affords a means of securing credits from a bye-product. However, in States where the coalfields, and even the mines, are almost at the door of the retort-house, we wonder why bituminous coal should not become the common, even the most economical, fuel. We changed from the use of coke to native coal about two years ago; and therefore the remarks which follow will be based on methods and results worked out during the past two years. The comparative figures, however, are based upon the average results obtained during the past year.

Since the proper handling of the bench fuel is the foundation of the economical production of coal gas, I will first take up the methods of handling and proper condition of use. The benches under fire were the ordinary settings of six retorts, semi-regenerative, of the half-depth type, 15 in. by 26 in., and 9 feet long, front clinkered, and fired from a slanting door slightly below the level of the fire-box arch. The grate area is about 18 in. by 42 in., with the fire-box widening at the top to about 36 inches, giving a depth of fuel bed of about 36 inches when filled. The arch has the customary nozzle openings leading to the body of the setting, from which the waste gases are led by ducts in backward and forward movement to the upright flues at each side. These meet at the top through cross flues leading to a central stack for each bench, about 20 feet in height. Dampers are set in the recuperating flues and not in the stack. Such a setting, with a shallow fire-box, is in a way better adapted to the use of coke, for the shallow fire will allow the rapid production of the fuel gases so greatly desired for combustion in the central chamber. The same condition is somewhat disadvantageous to the use of coal, since the fire must both coke the coal given to it and carry on the same process as in the coke fire.

With coal, the fires must be maintained at full depth—that is to say, the fuel must be as near to the arch as can be well handled, probably from 8 to 10 inches below, and nearly level; the coal being thrown to the back with the shovel, but not pushed back with a hook or stirring-bar, as this has a tendency to pack the bed—a condition which must be carefully avoided. They should be filled every two hours when using the ordinary mine-run grade. This quite even mixture of large and small lumps, egg and slack, will keep the fire free and open. If this method of firing is followed, there will be from 6 to 10 inches of fresh coal spread over the entire bed each time the fire is filled—giving the best condition for gasifying and proper combustion.

The clinkers are thoroughly removed from the fire-box twice a day, at the beginning of each shift; and the fire is broken and stirred from the bottom towards the close of the shift. By carefully cleaning the entire bottom of fine ash at the beginning of clinkering, only a brittle crust of clinker will remain on the bottom of the fire, which generally holds the main body from falling. By cutting away the clinker formation from the rear, and working forwards, all dead and clinkered ash may be removed, allowing the fire to drop at the rear first and the front last. We use a small quantity of steam under our grates, and keep the clinkers quite brittle. Coal clinkers have been found much easier to handle than coke clinkers. The two points to be watched most carefully are the rear and front walls of the box. Hoods over the water-table and projections from the rear wall are worse than the side clinkers, but are easily cleared away if care is taken in stirring and cleaning. For grates we use 1½-inch square iron grate-bars set about 2 inches apart. These allow the fine ash to fall to the pan when the bed is stirred at the time of firing—leaving a clear fire with no waste of fuel. What has been said in regard to clinkering might be summed up in a single statement: Neither coal nor coke can give good results unless the fire-box is kept clear, and its entire space is available for burning the fuel placed in it. We carry the draught dampers set as closely as possible, allowing only enough movement of spent gases to ensure sufficient draught for keeping clear, bright fires.

Comparing the proportions of primary and secondary air when using coal with those when using coke, we find the conditions almost reversed. Since coke does not disintegrate so rapidly as coal when heated and is firmer when hot, the primary dampers need not be opened so wide as with a coal fire, and yet they will still receive the proper amount of primary air to produce carbon monoxide or fuel gas in large quantities. This usually requires the secondary damper to be open from one-half to an equal amount with the primary one, in order to furnish the secondary air necessary to complete the combustion of the fuel gases produced, as they mix in the central chamber. With coal, the proportion is very different, though more primary air is needed than with coke. A much larger supply of secondary air is also necessary. The proportion is nearly two or three, and in some cases almost two, of primary to four of secondary. As a rule, only enough primary air is admitted to keep the fires burning brightly, so that heat enough may be secured for gasifying the coal in the fire-box and completing the combustion of the carbon. Under such conditions, as the oxygen of the air unites with the carbon of the lower part of the fuel bed, it produces carbon dioxide; but as it passes upward through the heated portion it is changed again to carbon monoxide. This gas, in connection with the ordinary hydrocarbon gases of the coal, is depended upon to produce the intense heat in the setting proper as it unites with the oxygen of the secondary air. Hence the large amount of secondary air necessary to complete the combustion. With these conditions in the fire-box, there is less tendency to troublesome clinker formation, and more ease in maintaining an intense white heat in the central chamber.

The advantage of a deep level fire can be easily seen. If free, it ensures an equal distribution of the primary air, equal production of the mixed fuel gases throughout the fuel bed, and delivers nearly equal quantities of these gases to every part of the central chamber, where they may be thoroughly mixed with secondary air to complete their combustion. If the proper proportion of the secondary air is given, and the movement of the burning gases is retarded as much as possible, the loss of energy will be reduced to a minimum.

When the coal is first fired, we lose some fuel on account of excess carbon particles thrown off, due to sudden change of temperature. This disintegration is so rapid that complete combustion cannot be secured with the amount of secondary air admitted; but within a few minutes—from 10 to 15—normal conditions are again established, and nearly complete combustion will then take place until the next period of firing. If enough secondary air were admitted to completely burn the excess carbon at the time of firing, there would be too great a proportion present during the latter part of the period, when the quantity of fuel gas is steadily diminishing. This would lower the temperature of the setting and produce a fluctuation in heat—the very thing it is desired to avoid. On the other hand, if we admit only the quantity needed in the latter part of the period, the loss of fuel during the first part is very great. Therefore we have endeavoured to avoid the extremes by using an amount slightly in excess of that needed in the period of normal combustion. This gives the greatest efficiency of the fuel by consuming the largest part of the excess of carbon when the coal is first fired, at the same time causing the least change in temperature at the latter part of the period; thus keeping the heat of the settings constant. Such conditions can be maintained if care is taken, and heats of as great uniformity and intensity secured as with the use of coke.

As a result of this method of using coal, we have had no trouble in keeping steady heats with an average use of 387 lbs. of coal per ton carbonized. During the year 1906, we carbonized an average of 375 lbs. of Youghiogheny coal per retort. This gave a yield of a little more than 66,000 cubic feet per bench, when the time occupied in decarbonizing was included in the averages. Less trouble was experienced with our settings and better work was secured from the stokers. The average amount of coke used for the same carbonization as that given above would be from 335 lbs. to 350 lbs. per ton carbonized. The quantity of gas coal needed would be about the same—probably averaging about 340 lbs. In actual weight per ton carbonized, the native coal is highest, and gas coal almost equal to coke; but in cost there is a great difference. In order to obtain these fuel results, the setting must be operated at its full capacity all the time.

On the basis of the full capacity, the cost per ton carbonized, with coke for fuel, will range from 42 c. to 43·7 c. when coke is charged at $2·50 per ton. More commonly it will be $2·75 to $3 per ton net, which will increase the above costs to 46 c. or 52 c. per ton carbonized. With gas coal, when an average of 340 lbs. is used, and the average price is taken at $3·50 per ton, the cost of carbonizing will be about 59·5 c. per ton; making it more expensive than coke at the above-named charge. Native coal, at an average price of $1·75 per ton, and using (say) 380 lbs. as fuel, will cost 33·25 c. per ton carbonized; showing a saving of from 9 c. to 10 c. per ton over coke, and about 26·25 c. over gas coal. Our own average of 387 lbs. through the past year, at $1·50 per ton, came to 29·1 c. per ton carbonized. Adding to this cost all extra labour expense for handling during a strike period gives a total expense of 29·48 c. per ton carbonized. The best result for the year was made during October, when with lump coal we used 324 lbs. of fuel at a cost of 24·34 c. per ton carbonized. This saved 36·9 c. per ton, as coke was then selling at $3·50 per ton. There are many companies who can secure mine-run coal for $1·50, and even as low as $1·25, per ton delivered. Here is a saving of from 12·50 c. to 18·50 c. per ton carbonized, or about 2 c. per 1000 cubic feet of gas produced. Where there is a ready market for coke at $4 or more per ton, the low cost of coal will prohibit the use of coke as an economic furnace fuel. Under such conditions, coke should be valued at between 45 c. and 60 c. per ton of coal carbonized, or about 16·5 c. to 31·5 c. more than the cost of the average amount of native coal needed, and an unnecessary expenditure of from 1·6 c. to 3·1 c. per 1000 cubic feet of gas produced. We have found it profitable to use native coal under the benches when coke netted only $2·25 per ton.

The following table shows comparative costs where different amounts and varying prices are considered:—

Native coal delivered at	$1·50	$1·75	$2·00	$2·25	$3·00 per ton.
375 lbs. used costs. .	28·1	32·8	37·5	42·1	56·2 per ton carbonized
380 ,, ,, ,, . .	28·5	33·2	38·0	42·7	57·0 ,,
390 ,, ,, ,, . .	29·2	34·1	39·0	43·8	58·5 ,,
400 ,, ,, ,, . .	30·0	35·0	40·4	45·0	60·0 ,,
Coke selling at . . .	$2·50	$2·75	$3·00	$3·25	$3·50 per ton.
350 lbs. used costs. .	43·7	48·1	52·5	56·8	61·2 per ton carbonized
400 ,, ,, ,, . .	50·0	55·0	60·0	65·0	65·0 ,,
450 ,, ,, ,, .	56·2	61·8	67·5	73·1	78·7 ,,

Gas coal, average costs. . . . . $3·50 per ton.
Average amount used 340 lbs. costs . . . 59·50 c. per ton carbonized.

In the course of the discussion on the paper, Mr. W. F. Clausen said the author had shown that in Illinois coal could be advantageously employed as fuel for retort firing; but he (Mr. Clausen) had not reached anything short of 400 lbs. for carbonizing a ton of coal. Their method of firing was, however, different from that used by Mr. Rhoades. They charged their furnaces every 30 minutes, as they found that short periods were more beneficial than long ones. They tried heavy charges of fuel at long intervals, and found they could not maintain the heats. Mr. W. E. Hartman asked what was the relative life of a setting in which coal was used, compared with one burning coke. He pointed out that the question was not one entirely of cost of fuel; they had also to consider the wear and tear. Mr. D. R. Russell, referring to the question put by the preceding speaker, said a bench of retorts, as ordinarily constructed and worked, would not last so long under a coal fire as under one of coke. He thought this was largely due to the longer flame and the great and rapid changes in temperature with coal. When coke was used for firing, the fuel, as a rule, was hot, and the changes were not nearly so great. Moreover, they had to clinker more frequently. Mr. F. Bredel said a retort-bench should be designed with special regard to the fuel to be used in it, and the same grate should not be made to burn any fuel one might put upon it. Mr. E. G. Schmidt said he did not care whether a bench was designed for coke, gas coal, or steam coal. At Springfield their benches were not built to burn coal; they were nevertheless doing it and making money.

Mr. Rhoades, replying to these remarks, said he could not make any exact statement as to the comparative life of retort-benches, but they had had two for a little more than four years. The first ran for rather over eleven months burning coke, and then they changed over to coal. It had been a sort of transitory period of experimental work between coke and coal for the last five or six months of the past year. The next settings were fired on coal for 25 months, starting without any coke; and he did not believe that there was 28 days' difference in the life of the two benches. There was not half the trouble in working with coal that there was with coke. So far as the effect of the coal on the settings was concerned, he did not think they would find any difference—at least, he did not; then, in comparing the two years, he did not find any of the settings melted down. In each case the arches had so worn by friction that the cross-pieces were eaten out, and the arch had to be removed in each case. As to the fire-boxes, his experience was that he had less trouble, in taking out the linings, by clinkers in the use of coal than in the use of coke. In one setting out of the stack, the furnace linings had to be renewed. When they used coke, they had to reline the fire-box from the bottom up; and the same box, under the use of coal, had just begun to wear out after 24 months' hard work, and would have to be relined again. But it was not in so bad a shape as when they used coke.

In the course of some further observations upon the paper, one speaker said he knew a small company who had been successfully using coal for firing the retorts. They were in settings of six, with three-quarter depth furnaces; and, using gas coal as the fuel, a ton was carbonized with 300 lbs. They shook up their fires every change of shift, but cut out the clinker every seven days only. He believed they were firing 150 lbs. of coal every two hours. Mr. R. W. Polk said that in the case just referred to the price of gas coal was $3·40 per ton. With regard to the designing of retort-settings, he considered they should try to get those which would burn either coal or coke; but he acknowledged that the results obtained with them would not be so good as with a setting designed to burn only one or the other. Mr. E. W. Eustace said that in Peoria their experience had been just the reverse of that of Mr. Rhoades. They found that if they made 9000 cubic feet of gas per retort they could carbonize a ton of gas coal with 360 lbs. of Illinois coal. If they increased the make to 10,000 cubic feet, it required 430 lbs. to 460 lbs.; and to make 11,000 cubic feet, the quantity was from 520 lbs. to 540 lbs. They could obtain 8000 or 9000 cubic feet economically; but if it was a question of 10,000 or 11,000 cubic feet, the draughts must be forced. Mr. Polk remarked, with regard to the time of charging the furnace, that Mr. Clausen got it down to 30 minutes. In the case of plant he (Mr. Polk) had operated, they had been putting in about half-a-ton of coal every six hours. These were, of course, the two extremes. He had worked benches day and night for three or four weeks, and found that the time mentioned by Mr. Rhoades for charging and barring-up the fire was borne out by his own experience. With coal, they used from 300 lbs. to 310 lbs., and the make was 60,000 cubic feet to the bench; but with coke (for which the settings were not designed) the make of gas was 66,000 cubic feet with 260 lbs. Mr. Bredel explained that when he spoke about benches being designed for the kind of fuel to be used, he really meant the grates. But it only required two or three hours to change the grates from coal to coke, or from gas coal to steam coal. In closing the discussion, Mr. Rhoades said one point had not been touched upon by the speakers, and it was in regard to the saving of labour by using coal in place of coke. It had been remarked that the latter material would probably be the more economical in this respect; but he had found it just the opposite. The time spent in removing the clinkers was greater with coke than with coal; and the time of charging was exactly the same. But the ease with which the bench was manipulated allowed the stoker to do better work with coal than with coke. Consequently, if asked which was the cheaper, so far as labour was concerned, he should say coal. This, however, might be simply due to the way they worked their retort-house.

THE FORMATION OF BLUE SALT.

At a recent Meeting of the Manchester Section of the Society of Chemical Industry, a paper on "The Formation of Blue Salt" was read by Mr. H. J. Bailey, A.I.C. It has been reprinted, with the report of the discussion, from the Society's "Journal," and the author has sent us a copy.

The report for 1905 of the Chief Inspector under the Alkali, &c., Works Act, contains a discussion on the formation of blue salt, the conclusions arrived at in which did not altogether appear to agree with the practical working experiences of the author. Mr. Linder's experiments seem to lead to the conclusion that blue salt is due to the presence of insoluble ferri or ferro cyanides formed in two stages by the interaction of ferrous sulphide with neutral or alkaline ammonium cyanide, thus:

$$6NH_4Cy + FeS = (NH_4)_4Fe(Cy)_6 + (NH_4)_2\,S$$

The ammonium ferrocyanide so formed interacts with ferrous sulphate contained in the saturator to give ferrous ferrocyanide—a white precipitate, which afterwards is oxidized to Turnbull's or prussian blue, thus:

$$(NH_4)_4Fe(Cy)_6 + 2FeSO_4 = Fe_2Fe(Cy)_6 + 2(NH_4)_2\,SO_4$$

The conclusion, therefore, is that blue coloration of the salt can only occur when local or total alkalinity produces a precipitate of ferrous sulphide, with which the alkaline cyanides entering the saturator can interact; and that if the saturator be kept sufficiently acid, blue salt should not be obtained except when excessive priming occurs.

Working with an "Otto-Hilgenstock Feldmann" still and open saturator, it is invariably observed that, whenever blue salt (or salt afterwards turning blue) has appeared, the steam, entering the saturator with its charge of alkaline gases, was more or less condensing before ever reaching the saturator; and even if this irregularity were observed and corrected in a freshly made-up or strongly acid saturator, the resulting salt was invariably tinged with blue. When this occurred, the acid in the saturator lost its "boil" and fell flat.

The following observations throw some light on the subject, which is an important one. (1) A still and vat, after having been in work for ten days, at top steam pressure, on a good make of white salt, so that a "free boil" was observed in the open part of the saturator, was allowed to prime by raising the steam pressure still further, at a time when the vat at 60° Twaddel was nearly half full of salt. The vat made up 2 inches in height, clouds of steam arose, and most of the salt went into solution. A quick change was effected, so as to put the still into work again, and in 3½ hours the vat was "fished" at 57° Twaddel, when a good white salt was produced which did not turn blue on standing. (2) A saturator (open type) which had been giving a good white salt for three weeks, owing to a temporary block in a waste-gas bend "blew" badly for some five minutes. The attendant lowered his still pressure slightly while the obstruction (a choked condensation pipe) was removed. On returning to the vat, the steam-pipe leading into the vat was tested and condensation was observed. This was at once rectified—everything being done within rather more than half an hour. The next batch of sulphate had a decidedly blue tint, deepening on storage. After about three "fishings," the blue tinge disappeared from the salt, and good white salt was obtained for the remaining period. The vat was in work for some seven weeks.

The working temperatures of the saturator at various periods during saturation were taken, as also the temperature of the steam, ammonia, &c., as they entered. The saturator was worked on the intermittent "fishing" principle, and the cycles, from making-up to "fishing," occupied from six to eight hours. The results appear next page.

1.—Fifty grammes A (I.) were placed in a beaker, and ammonia liquor (freshly made) distilled into it for ten minutes. The temperature in A rose from 30° to 97° C. The solution was cooled so that salt crystallized out; and no blue colour appeared. The free acid found after the test was 14·41 per cent.

2.—Fifty grammes B (I.) were treated as above. A bluish-green colour was noticed at first. The temperature rose from 30° to 95° C. The salt produced was slightly blue. The filtered cold solution was colourless. The free acid in solution amounted to 5 per cent. No precipitate of sulphide of iron was noticed.

3.—Sample A was treated with distilled liquor; but the distillate was passed through a condenser so as to keep the temperature below 30° C. A dark green precipitate was produced. The distillation was continued for ten minutes; then the sample was vigorously boiled at a temperature of 101° C.; evaporated to half its bulk; and allowed to crystallize. The salt had bright blue colours; the solution was also blue. The free acid in the solution amounted to 14·25 per cent. No black precipitate of ferrous sulphide was observed during the distillation.

4.—Solution B was treated with distilled liquor in the hot. The temperature rose from 94° to 98° C. during the distillation. The distillation was continued until the solution was nearly alkaline, and then allowed to crystallize. The salt was found to be of a dead-white colour; the filtrate had a pale yellow colour. No sulphide of iron had been formed.

5.—Solution B was treated with hot distillate from the liquor. The temperature rose from 97° to 102° C. The distillation was continued until B was strongly alkaline; a black precipitate of

TABLE A.

Time.	Steam Temperature.	Saturator Temperature.	Degrees Twaddel.
p.m.	Deg. C.	Deg. C.	
2.15	Just made up	..	..
2.30	90	97	66·5
3.00	96	104	68·0
4.00	97	107	70·0
4.30	97	108	71·5
5.00	96	108	71·5
5.30	96	106	68·0 (Salt separating)
6.30	95	105	63·0
7.00	95	104	61·0
8.00	95	104	59·0 (Fishing)

TABLE B.

Time.	Steam Temperature.	Vat Temperature.	Degrees Twaddel.
p.m.	Deg. C.	Deg. C.	
12.45	94	100	64·5
1.30	93	104	70·0
2.00	93	107	71·0
3.00	93	101	72·5
4.00	94	111	73·5
4.30	93	109	71·0 (Salt separating)
5.00	93	109	69·0
6.00	94	109	96·5
6.30	94	108	64·0 (Fishing)

In both of these typical cases, the salt made was of a good white grey. No trace of blue or discoloration was noted after three weeks' storage. Samples of the acid liquor were taken from the saturator, both after the vat had been freshly made up and at "fishing" point, and were tested for iron and free acid:—

A.—*Sample of "Made-up" Vat.*

	Twaddel.	Fe_2O_3.	Free H_2SO_4.
		Per Cent.	Per Cent.
I.	68	0·25	18·72
II.	66	0·24	20·68
B.—*Sample of "Fishing" Liquor.*			
I.	58	0·52	4·12
II.	57	0·46	4·65

The above samples when filtered hot were all of a light yellow colour, and the salts crystallized from the filtered solutions dead-white. Portions of the samples were tested in the laboratory, to discover, if possible, how blue salt could be made therefrom.

sulphide of iron was formed. The salt that crystallized out was buff-brown colour when dried; the solution also was of greenish-brown colour. A portion of hot solution was acidified with sulphuric acid, when effervescence occurred and sulphuretted hydrogen evolved. The salt from this portion was white, and no trace of blue or green was observed in the solution.

6.—Solution A was treated with hot distillate from the liquor, and the temperature in A kept above 100° C.; 2 c.c. of raw cold liquor were introduced during distillation, when the temperature dropped from 103° to 100° C. Then the solution was cooled, and the salt allowed to crystallize out. The salt was found to be dead-white, the solution was pale yellow. There was a greenish colour produced where cold raw ammoniacal liquor met solution A, which immediately disappeared with effervescence.

7.—Solution B was treated as above. The temperature dropped from 100° to 98° C. on introducing cold liquor, then rose again to 100° C. A green colour was noticed as in No. 6 where cold liquor met B; disappearing immediately with effervescence. The salt obtained was dead-white in colour, and the solution pale yellow. No trace of blue or green was observed in either, nor any trace of black sulphides in either No. 6 or No. 7 when the cold liquor was introduced.

8.—Experiment No. 6 was repeated with A at 70° C., when the resultant salt and solution were both found to be also free from blue or green colorations.

9.—Solution A, kept at a temperature of 95° to 100° C. was treated with condensed distillate from the liquor. A greenish precipitate was formed, and the solution afterwards boiled down. The crystallized salt and the solution were deep blue in colour.

10.—Solution B was treated as in No. 9, while the temperature was kept between 100° and 103° C. in B. The resultant salt and liquor were deep blue.

[In both No. 9 and No. 10 black sulphide of iron was noticed, where the condensed distillate met the hot solutions, immediately redissolving with effervescence.]

11.—Solutions A and B were both treated with a few drops of potassium cyanide solution in the cold. A brisk effervescence occurred, and the salt obtained was in both cases blue; solution B giving a much deeper tinge than A. Both solutions were boiled down after the addition of cyanide so as to allow the salt to crystallize out.

12.—Fifty cubic centimetres of an 0·2 per cent. iron solution (ferrous iron) were treated with 5 grammes of concentrated pure H_2SO_4. Then 2 c.c. of dilute potassium cyanide solution were added, and a deep blue colour was immediately produced. On boiling the solution, the blue colour was maintained.

13.—Experiment No. 12 was repeated, but with boiling solutions, when a deep blue colour was produced.

The ammonia liquor for the foregoing test was, in each case, tested for cyanides, and was always fresh. Cyanides were found in small proportions in each test made. The total ammonia ranged from 0·77 to 0·81 per cent.

It thus appears that the formation of blue salt is due to the presence of volatile cyanides in the saturator for a sufficiently long time to enable them to interact with the iron present in the acid. It can occur quite readily in a strongly acid solution, provided time to react be allowed.

In ordinary working, the heat of reaction in a strongly acid solution is such that condensed cyanides entering the saturator would be more liable to be immediately vaporized than in a partially or nearly saturated solution. This may, no doubt, explain why temporary irregularities in still-working do not so readily give blue salt at the time when the liquor is strongly acid or "freshly made up."

If the formation of blue salt be due to local alkalinity, it is difficult to explain how it comes about that, when a saturator "burns" or works on the alkaline side for a period, it is quite possible to fish white or grey salt by adding an excess of acid at the time of "burning," and that such salt does not turn blue on storage.

When a vat has occasionally commenced to "burn," under the author's observation, the temperature of the steam and vat have been far too high to allow of volatile cyanides being fixed; and salt fished at such a time is invariably brown or "burnt," and if redissolved in acid and recrystallized gives no trace of blue. The reaction of the volatile cyanides with the ferrous or ferric salts present in the acid, appears to take place only when sufficient time-contact is allowed for their interaction; and this only occurs when condensation of the steam and gases entering the saturator takes place. It is also accompanied with bad results on the still working and high "waste liquors." Several attempts to decompose the blue precipitate formed have been made, but without permanent success when the solutions were acid.

As a general rule, in order to make white salt, the still pressure should be so arranged that the steam enters the saturator dry. To this end, the liquor entering the top of the still must be superheated, and all steam-pipes must be well covered. The temperature of the saturator must also be kept at 100° C., or slightly above if possible; and the size of the saturator should be so proportioned that this can be done by the steam carrying the ammonia from the still.

Priming of the liquor in the still, if continued to any extent, might cause "blue salt," by providing sufficient condensed cyanides for interaction in the vat; but, in the author's opinion, it is a rare cause, and may actually occur for a few minutes without the resultant salt being blue.

Further experiments, with a view to ascertain whether acid cyanides can interact with acid ferrous or ferric salts in the presence of ammonium sulphate, are being made.

Discussion.

Mr. R. FORBES CARPENTER hoped the discussion of the paper would ultimately prove that no irreconcilable differences existed between the views held by the author and himself as to the causes leading to the production of blue salt. While Mr. Linder's experiments recorded in the last annual report showed that local alkalinity in the saturator was, he believed, a necessary precedent condition, Mr. Bailey's experiments had naturally led him to attach very great importance to the conditions produced by low temperature in the saturator and in the gases and vapours coming to it from the still as favouring condensation. Low temperature in favouring condensation tended to produce two conditions necessary before blue salt resulted: (1) Local alkalinity in the interior and in the neighbourhood of the vapour-distributing pipe, because there would be lessened boil in the saturator liquors, and so less rapid mixture of their contents, leading even to stagnant conditions in parts; and (2) increased solubility of hydrocyanic acid, and so increased opportunity for the formation of ferrocyanide in alkaline or neutral solution in the above-mentioned proximity to the distributing-pipe. Soluble iron salts must also be present. These were usually present in some measure in the acid. Various accidental circumstances, such as were mentioned in the report, might lead to a temporary increase in the percentage of iron in the liquors in the saturator. The product first formed in these conditions was ammonium ferrous ferrocyanide—a white insoluble salt, which pitched with the crystals of ammonium sulphate, and was fished with them. On exposure to the air, oxidation took place, with the familiar blue tinge as a result in the mass of ammonium sulphate crystals. At one works known to him, the workmen among themselves had invented a test by applying a ferric salt in acid solution to a sample fresh drawn from the saturator. Each man on taking over the charge of the saturator from his mate applied the test, so that the blame, if due, might attach to the right person—since it was clearly recognized that the objectionable white ammonium ferrous ferrocyanide might be already formed, to be fished with

the salt at a later stage only. Had Mr. Bailey applied oxidation tests to the samples of salt obtained in his experiment, so as to prove the absence of contamination? The most convenient way was to add a few drops of hydrogen peroxide, when blue colours would at once develop if ferrocyanides were present. One set of Mr. Bailey's laboratory experiments was quite apart from those carried out on samples of liquor derived from the factory—viz., those in which to solutions of iron salts, rendered strongly acid by sulphuric acid, a solution of potassium cyanide was added, with resultant blue coloration. Mr. Linder had repeated these experiments, but without obtaining any blue colour, or even tint, unless the precaution was observed of carefully pouring the strong potassium cyanide on to the surface of the acid solution. As the cyanide had a strongly alkaline reaction, at the junction of the two liquids a momentary precipitation of ferric oxide was observed. On shaking, this immediately, of course, dissolved; but locally alkaline conditions had lasted sufficiently long to result in the formation of a trace of ferrocyanide, with resulting very slight blue tint in the solution. These conditions were very special, and were not those obtaining in a saturator. Conversely, the experiments of both Mr. Linder and Mr. Bailey showed that the conditions for avoiding blue salt were to avoid priming, and therefore to keep the steam pressure regular; to avoid condensation of liquor distillates in the saturator, and therefore to keep up the temperature of the latter; and to maintain a good boil and rapid mixing of the saturator contents. This would avoid local alkalinity in the solution, which, generally speaking, would still show excess of free acid, and so also avoid opportunity for solution of hydrocyanic acid from the vapours or the saturator liquor, and likewise accumulation of iron salts.

Mr. W. H. Coleman said his experience tended to confirm the view taken by Mr. Carpenter and Mr. Linder in the report—that the formation of blue salt was due to an alkaline saturator. It seemed to him that when condensation took place in the pipe conveying the ammonia gas and steam to the saturator, one had all the conditions necessary for the formation of ammonium ferrocyanide, and consequently of blue salt. The interior surface of the iron pipe would be covered with a film of condensed liquor containing ammonia and hydrocyanic acid, and this would combine with the crust of iron sulphide nearly always found on the interior surface of the pipe to form ammonium ferrocyanide, which would form prussian blue with any iron contained in the saturator liquor when it became acid again. Of course, white ferrous ferrocyanide would be formed first, which would oxidize into the blue ferric compound. In view of this paper, he had tried some experiments in the laboratory, and had found that, with an average sample of gas liquor, prussian blue was always formed if the distillate was allowed to become alkaline when an iron compound was present in the acid in which the gas was absorbed. No blue was formed when either ammonium sulphocyanide or ferrocyanide was distilled in the presence of ammonium bicarbonate or sulphide; so that it seemed that, in order to get blue salt, the gas liquor must contain ammonium cyanide. There was more danger of getting blue salt when very fresh gas liquor was distilled, as most of the ammonium cyanide was, on standing, converted into sulphocyanide or ferrocyanide.

Mr. Bailey, in reply, said he was inclined to agree with Mr. Carpenter that fixation of cyanides could only occur in the alkaline state. He found it extremely difficult to get a neutral cyanide. He tried distilling ammonium sulphate with potassium cyanide made as neutral as possible, and had obtained a brilliant blue colour on distilling into ordinary saturator liquor. The samples were allowed to stand exposed to the air for some three weeks before comparing the colours, and all crystallized salts were then treated with hydrogen peroxide and stood the test. The colour of the salt when fished was never taken as conclusive. Blue salt had to be sold generally at something like 20s. under the price of white or grey salt. Since working on the theory of still temperature, he had never had blue salt except in case of accidents, though for six months previous nothing but blue salt had been made. The potassium cyanide referred to by Mr. Carpenter was not neutral, but as nearly so as it could be made. In reply to Mr. Coleman, he said that if the iron piping was the cause, it was difficult to explain the erratic way in which blue salt was formed; and there was always enough iron in the acids used commercially to supply all the iron salts necessary. With continuous fishing saturators, the strength never went below about 61° Twaddel, which corresponded to 8·5 per cent. of free acid, and yet blue salt had been made in such saturators. He agreed with Mr. Coleman that it was necessary for the cyanides to occur as ammonium cyanide to give blue salt; but he had also found a solution of ammonium sulphocyanide to be distillable to a certain extent, though text-books said the reverse. He was afraid an insufficiency of acid would not account for all the difficulties met with, as where a series of steam bubbles, containing from 14 to 18 per cent. of free ammonia, passed through a dilute acid solution, as in a sulphate saturator, there must always be points of local alkalinity; and if there were no other conditions necessary, blue salt should, he believed, be continually made. But his own opinion was that the temperature and time of contact did not allow of the fixation of the cyanides, unless the steam carrying these cyanides was partially condensed before passing through the acid liquor. This would come to be the solution generally accepted. The routine of the sulphate-house had, no doubt, a great deal to do with the question, and required the closest personal supervision.

STEAM IN GAS-PRODUCER PRACTICE.

At the Spring Meeting of the Iron and Steel Institute, recently held at the Institution of Civil Engineers, under the presidency of Sir Hugh Bell, a paper on this subject—the joint production of Dr. W. A. Bone, F.R.S., Professor of Fuel and Metallurgy in Leeds University, and Mr. R. Vernon Wheeler, of Warrington—was submitted, and gave rise to considerable discussion.

The authors recorded, in detail, results of experiments carried out during May and June last year with a gas-producer plant at the iron and steel works of Monks, Hall, and Co., of Warrington, with the view of determining the influence of variation in the proportions of air and steam in the blast upon the composition of the gas, its suitability for furnace operations, and upon the general and thermal efficiencies of the producers. The investigation comprised a series of five trials, each extending over a full working week, with the plant supplying washed gas both for gas-engines and for re-heating and puddling furnaces—all working under normal conditions; but from week to week the relative proportions of steam and air used in the blast for the producers were varied by raising the steam-saturation temperature of the blast in stages of 5° each from 60° to 80° C. The latter represents ordinary Mond practice when ammonia-recovery is not attempted.

The paper opened with an explanation of the action of oxygen and steam upon incandescent carbon, and a definition of the reversible reaction. The authors pointed out that there is still considerable difference of opinion among chemists as to the mode of combustion of solid carbon. The commonly accepted view is that carbon burns directly to carbon dioxide, which in contact with an excess of incandescent carbon is immediately reduced to carbon moxoxide, thus—

$$C + O_2 = CO_2 \text{ and } CO_2 + C = 2CO$$

Others are of opinion that the balance of evidence is in favour of the view that solid carbon, like cyanogen, burns directly to carbon monoxide, and that carbon dioxide is only formed by the secondary combustion of the monoxide thus—

$$2C + O_2 = 2CO \text{ and } 2CO + O_2 = 2CO_2.$$

The large amount of heat so generated in the burning of the carbon to carbon monoxide would, if not in part absorbed in decomposing steam, give rise to inconveniently high temperatures in the producer, with consequent clinker troubles and other practical difficulties. The use of steam in the blast, however, allows of part of this heat being at once utilized in doing chemical work in the producer, and thereby raising the potential energy of the resulting gas at the expense of some of its sensible heat.

The composition of the gas obtained when steam reacts with solid carbon depends mainly upon the temperature. At comparatively low temperatures (about 500° C. to 600° C.), the chief products are carbon dioxide and hydrogen. At temperatures between 600° and 1000°, carbon monoxide gradually replaces carbon dioxide; at 1000° and upwards the main reaction involves the production of equal volumes of carbon monoxide and hydrogen (water gas). Both reactions are endothermic, and consequently both operate in reducing the temperature in the producer and in raising the thermal efficiency of the system.

Passing on to consider the influence of the reversible reaction, the authors remarked that at all temperatures above 500° C., or thereabouts, steam reacts with carbon monoxide, and hydrogen with carbon dioxide, the two reactions constituting a reversible system—

$$CO + OH_2 \rightleftarrows CO_2 + H_2.$$

The amount of change in each direction in the unit of time depends on the relative masses (concentrations) of the reacting gases. The change in the direction

$$CO_2 + H_2 = CO + OH_2$$

involves an absorption of heat; while that in the opposite direction involves a corresponding evolution of heat. The relative proportions of carbon monoxide and dioxide in the resulting gas are also, to some extent at least, influenced by this reversible change. At higher temperatures than 1000° C., the percentage of carbon dioxide remaining when equilibrium is established is probably extremely small. The percentage of carbon dioxide in the resulting gas tends to increase when the temperature of the zone of reaction in the producer is lowered by the use of steam in the blast, and *vice versâ*. The efficiency of the producer and the composition of the resulting gas will, *cæteris paribus*, be largely determined by the relative proportions of steam and air in the blast, inasmuch as the temperature of the bed of fuel depends on the amount of steam employed. The use of steam is limited by the consideration that a certain fairly high temperature must be maintained in order that the gasification of the fuel may proceed at all; but a certain proportion of steam is employed to reduce clinkering troubles to a minimum. The amount so required depends principally upon the character, and, to some extent, also upon the amount, of the ash in the coal used.

The authors next described the plant used for the trials, and specified the purposes for which the gas produced was utilized. These were: (1) Two re-heating furnaces in a 10-inch bar mill; (2) one 650 H.P. gas-engine driving the rolls on the mill; (3) one swarfe furnace, with an output of 3½ tons per shift of twelve hours; (4) one puddling furnace, with an output of 3½ tons per shift; and (5) one 250 H.P. gas-engine generating electricity. The rated

capacity of the two producers corresponded to a gasification of 32 cwt. of coal per hour (16 cwt. per producer); but since the furnaces and engines never necessitated a gasification of more than 24 cwt. per hour, the plant was not worked beyond about three-quarters of its rated capacity. The rate during the day shift was always about twice that of the corresponding night shift. The charging-hopper of each producer had a capacity of 10 cwt. of coal, and, under normal conditions, a charge was added, to each producer alternately, once every half-hour during the day shift, and once every hour during the night shift.

Suitable arrangements were made for (1) the weighing of the whole of the coal charged into the producer, as well as of that burnt under the boiler, throughout each trial; (2) the continuous sampling of the gas over a period of eight hours during each day shift—each sample therefore representing the mean composition of the gas generated in one day; (3) the daily estimation of ammonia, tar vapour, and sulphur compounds in the gas; (4) the weekly collection and weighing of the tar deposited throughout the plant during each trial; (5) the weighing of the dried ashes, clinker, and coke withdrawn from the water-troughs at the bottom of each producer; and (6) the estimation of the amount of soot and fine ash carried over by the gas and deposited in the mains during each trial. The samples of coal, tar, ashes, soot, gas, &c., were afterwards submitted to careful analysis, and the calorific values of the producer coal, boiler fuel, and tar were all determined with a Berthelot-Mahler bomb calorimeter. From the analytical data were calculated: (1) The total carbon in a ton of dry coal charged into the producer; (2) the proportion of this carbon lost in the tar, ashes, and soot; (3) the proportion of the carbon actually gasified; (4) the weight of carbon in a cubic foot of the gas produced; (5) the yield of gas per ton of coal gasified; and (6) the calorific value of the gas per cubic foot, measured at 0° C. and 760 mm.

In the authors' opinion, the efficiency of a gas-producing plant should have reference to the gas as delivered to the furnace main or the engines, and should be based on the net calorific values of the coal and gas respectively. It should include the coal burnt under the boiler for raising steam for the blast, *plus* that required for the blower engine; and also, where it is necessary to cool and wash the gas for engines, it should include the coal equivalent of the mechanical work required for the washing. The efficiency would then represent the ratio of the available energy of the gas, as supplied to the furnace or engine, to the energy of the coal required to produce it. They were also able to deduce from their results what proportions of the oxygen present in the gas as oxides of carbon were derived from the steam and air respectively in the blast, and also what proportion of the steam was actually decomposed in the producer throughout each trial. All these figures, together with other information as to the quantities of ammonia and sulphur compounds present in the gas, were included in the results of each trial, which the authors next proceeded to consider in detail.

The principal results of the five trials are summarized in the accompanying table. The average pressures under the grate of the producers, and the temperatures of the gas as it left the superheaters, and in the furnace main, for both day and night shifts throughout the trials, were lowest with a steam-saturation temperature of 60° C., and highest with it at 80° C.; the pressures varied between 7 and 15 centimetres of water during the day, and between 2 and 6 centimetres during the night. The gas from the superheaters varied between 170° and 270° by day, and between 35° and 160° by night. The variations in the furnace main were respectively 66° and 121°, and 10° and 56°. The summarized results show that the quality of the gas obtained, though always good, steadily deteriorated as the steam-saturation temperature was raised beyond 65°. This falling off in quality was, it is true, partly counterbalanced by an increase in the quantity produced per ton of coal gasified; but the general efficiency of the process fell off as more steam was used. In fact, as the steam-saturation temperature was raised, the gas became richer in hydrogen and carbon dioxide, but much poorer in carbon monoxide; and the gain in hydrogen was more than counterbalanced by the loss in carbonic oxide. This was due to the steam lowering the reaction temperatures in the zone of combustion.

Under the conditions of the trial, the thermal efficiency of the plant fell from 71·5 to 60·4 per cent. as the steam-saturation temperature was raised from 60° to 80°. If, however, live steam only had been used for the blast, the corresponding fall would have been from 68·7 to 57·8 per cent. And even if it had been possible to saturate the air-blast with exhaust steam entirely throughout the trials, the efficiency would have fallen from 71·5 to 66 per cent. Hence it is clearly proved that the use of steam over and above that required to saturate the blast at 60° does not lead to higher thermal efficiencies. The question may be asked: Would the efficiency have been raised above 71·5 per cent. if the steam-saturation temperature had been lowered beyond 60°? Possibly, and indeed probably, it would have been; but the authors were precluded from making the trial for fear of clinkering troubles arising with so deep a bed of fuel. They intend making a series of trials with steam-saturation temperatures lower than 60°, but with a much shallower fuel bed than was used in the trials described in the paper.

In drawing their valuable contribution to a close, the authors offered a few remarks on residual products. They said that if a gas-producer is regarded primarily as an apparatus for the recovery of ammonia, then undoubtedly it should be worked with the highest steam-saturation temperature consistent with the production of combustible gas. The ammonium sulphate equivalent of the ammonia in the gas during the trials increased from 39 lbs. to about 72 lbs. per ton of dry coal gasified, as the steam-saturation temperature of the blast was raised from 60° to 80°. The nitrogen in the original coal corresponded to an average of 147 lbs. of ammonium sulphate per ton. So that with a steam-saturation temperature of 80°, nearly 50 per cent. of the nitrogen in the coal is accounted for as ammonia in the gas; and even with a saturation temperature of 60°, as much as 27 per cent. of it can be recovered. Probably the best steam-saturation temperature, if ammonia-recovery is considered in conjunction with the suitability of the gas for furnace purposes and the thermal efficiency of the process, is somewhere in the neighbourhood of 65°, or possibly between 65° and 70°. At 65°, more than 30 per cent. of the nitrogen in the coal can be recovered as ammonia, or nearly double the amount usually recovered in bye-product coking processes, in conjunction with a gas that is very suitable for furnace purposes.

Altogether, 419 tons of coal, containing 736,200 lbs. of carbon, were charged into the producer during the trials. The amount of anhydrous tar obtained, including both that removed in the washing of the gas and that carried forward to the furnaces, amounted to 24·1 tons, or 5·75 per cent. of the weight of the coal charged. The net calorific value of this tar was 2890 kilo. cent. units per pound; and the actual heat lost in the tar was as nearly as possible 5 per cent. of the net calorific value of the coal. The carbon in this tar amounted to 44,920 lbs., or 6·1 per cent. of the total carbon charged into the producer. The carbon lost in the ashes, and as soot deposited in the gas-mains, amounted altogether to 9666 lbs., or 1·3 per cent. of the total carbon charged into the producer. Thus the average amount of the carbon originally put into the producer which appeared as permanent gas was as nearly as possible 92·6 per cent. The sulphur originally in the coal amounted to about 19 lbs. per ton. Of this, the authors calculate that 16·5 lbs., or 87 per cent., appeared in the gas, chiefly as hydrogen sulphide. The amount of hydrogen sulphide in the gas was about 0·1 per cent. by volume.

Steam-saturation temperature	60° C.	65° C.	70° C.	75° C.	80° C.
Coal consumption at producer, cwt. per hour	16·51	14·26	13·88	14·32	13·21
,, ,, boiler	2·00	1·80	2·38	2·87	3·35
,, ,, for blast-steam	Nil	Nil	0·66	1·17	1·65
Total carbon losses, per cent.	5·80	7·80	8·10	7·10	8·40
Mean percentage composition of gas obtained—					
Carbon dioxide	5·25	6·95	9·15	11·65	13·25
Carbon monoxide	27·30	25·40	21·70	18·35	16·05
Hydrogen	16·60	18·30	19·65	21·80	22·65
Methane	3·35	3·40	3·40	3·35	3·50
Nitrogen	47·50	45·90	46·10	44·83	44·55
Total combustibles	47·25	47·10	44·75	43·50	42·20
Calorific value of gas (kilog. cent. units per c. ft. at 0° C. and 760 mm.) Gross	46·77	46·74	44·74	43·37	42·73
Calorific value of gas (kilog. cent. units per c. ft. at 0° C. and 760 mm.) Net	43·60	43·32	41·14	39·65	38·69
Yield of gas, cubic feet per ton	138,250	134,400	141,450	145,800	147,500
Pounds of steam in blast per pound of coal gasified	0·45	0·55	0·80	1·10	1·55
Percentage of steam decomposed	87·40	80·00	61·40	52·00	40·00
Cubic feet of air, at 0° C. and 760 mm., in blast per pound of carbon gasified	36·95	34·90	36·80	36·90	37·10
Ratio of $\frac{\text{oxygen from steam}}{\text{oxygen from air}}$	0·50	0·62	0·65	0·75	0·80
Ammonia in gas, as pounds of sulphate of ammonia per ton of coal	39·00	44·70	51·40	65·25	71·80
Efficiency ratios in actual trial—					
(1) Including steam for blower-engine	0·778	0·750	0·727	0·701	0·665
(2) ,, ,, ,, and washers	0·715	0·687	0·660	0·640	0·604

EVOLUTION OF THE INVERTED GAS-LIGHT.

Recent issues of the "Journal für Gasbeleuchtung" contain a very lengthy serial article upon the evolution of the inverted gas-burner, the text of which is really an abbreviation of a book upon the subject shortly to be issued in Germany from the pen of Herr Ahrens, of Berlin.

Herr Ahrens sketches the evolution of the inverted burner to its most recent forms from the early pre-Welsbach days when Clamond exhibited his inverted regenerative injector burner, with its flame playing upon an incandescence body of magnesia, at the Crystal Palace Exhibition in 1882. After this came other burners designed on somewhat similar lines, in all of which provision was made to heat the gas or the primary air, or both, by means of the combustion products. One of the first men to effect a sensible improvement on these early burners was Kent, who recognized that if the lower part of an inverted mantle were to be properly brought to incandescence, the mixture of gas and primary air must be led downwards to the centre of the mantle through a tube of narrower diameter than it. Kent also employed a broader mantle than is used in the upturned burner, and adopted a mixing-tube bent at right angles, in the manner that has been recently introduced afresh. The want of success achieved by the Kent burner can only be attributed to the inferior quality of mantles available in his days, and to the imperfection of the regulating nipples, &c., then manufactured.

Burners with Cooling Devices for the Gas.

Burners which may perhaps be regarded as prototypes of those now employed were originally introduced by Mannesmann and by Bernt and Cervenka, of Prague, the former of whom designed a burner having a horizontal flange above the orifice in order to deflect the combustion products from the primary air inlets. Bernt and Cervenka's burner carried an inverted cone for the same purpose—both cone and mixing-tube being constructed of glass or porcelain in order to prevent the burner firing-back; while it possessed an additional improvement, inasmuch as space was left between the burner-tube and the mouth of the mantle so that the combustion products could escape from inside without having to penetrate the substance of the mantle itself.

Although modern experiments show that no appreciable effect upon the behaviour of a burner is produced by constructing portions of it of material exhibiting low heat-conducting power, burners are still being made, especially in France and England, in which the depending mixing-tube is made of porcelain and formed externally as a deflecting cone for the combustion products. In France, indeed, burners have been constructed with mixing-tubes of steatite; metal rings being put round the material to prevent it splitting. Quite recently Glinicke has packed rings of asbestos compressed within a metal case round the mixing-tube of his burners in order to keep them cool; while to avoid the injury done to unprotected metallic tubes, Cheval has constructed an inverted burner having the lower half of its mixing-tube formed of porcelain and screwed into an upper part of metal—the bore of the whole being designed according to the Kern principle. Other attempts to protect the nipples and the fittings from the heat of the flame have been made by putting a horizontal disc covered with insulating material round the burner, by forming the burner mouthpiece and horizontal plate out of one piece of insulating material, by making the burner itself in two pieces with a joint folded round a washer of asbestos or the like, or by connecting the nipple with the burner-tube through one or more sockets or reducing pieces composed of steatite or porcelain. This last idea is incorporated in the Kramer lamp; the notion being to keep the nipple cool but to allow the mixing-tube to get hot. In the Bachner lamp, on the other hand, both portions are protected from the heat by surrounding them with a solid ring or hollow jacket of insulating tube.

A different plan for keeping the burner cool consists in constructing the outer portion in such a way that it may possess a high heat emissive power, either by fitting ribs on the outside or by using a deflector composed of gauze. In some burners made on these lines the gauze or perforated metal deflector is continued upwards so as to surround the entire mixing tube. Modern experience tends to show that the behaviour of a burner is scarcely affected by increasing its heat emissive power, unless the device is reinforced by some other cooling arrangement. In the Lehmann burners, which have these radiating attachments, the burner-tubes are thoroughly insulated from the nipples; while in the Stobwasser burner the mixing-tube is subdivided into several portions joined together by sockets of insulating material, each portion being provided with a hemispherical projection for the dissipation of the heat. In another burner, the mixing-tube is surrounded by a double jacket so arranged that the tube may be kept cool by a circulation of air.

In burners provided with solid metallic deflecting cones, it has been attempted to keep the tubes cool by supporting the rings on insulating material; but the defect still remains that the primary air inlets are surrounded by an atmosphere deficient in oxygen. To obviate this defect, the deflecting cones are sometimes enclosed at their upper part; an orifice being left at one spot only in the side wall of the jacket, so that the combustion products may escape locally in a direction which carries them away from the air inlets and from the burner fittings. This plan was originated by Reiss, of Berlin. As a rule the deflector with its single opening is made to rotate about the main tube of the burner, so that the combustion products may be kept away from the pendant or bracket. Eisner, however, has adopted the method of fitting the horizontal top plate of the burner with several openings, all of which, save one, can be closed by the revolving of a perforated plate. In a burner introduced by the Gesellschaft für Hängendes Gasglühlicht, the mouth of the burner is composed of porcelain extending laterally as a horizontal disc, in the manner already described; but the outer edges of the plate are provided with two or more short chimneys, pointing obliquely upwards and outwards, to carry away the combustion products, the diameter of the chimneys diminishing from their bases. These chimneys can also be constructed of metal, and are usually fitted at their upper extremities with dampers for regulating the draught.

Most authorities now hold that the cooling of an inverted burner tube does not affect its illuminating power or duty; and therefore devices for the purpose referred to have been generally abandoned. Nevertheless, it is of the utmost importance that the products of combustion should be prevented from commingling with the primary air, and so methods for withdrawing the products from one side of the burner only are very advantageous.

Burners Heating the Gas and Primary Air.

If an inverted burner is constructed with the enlarged orifice common in upturned burners, a certain proportion of the gas tends to escape combustion by slipping upwards round the sides of the burner tube immediately it issues therefrom. Attempts were made by the early inventors to avoid this defect by narrowing the orifice of the tube, and also by prolonging the tube downwards to the centre of the mantle. According to Drehschmidt, an inverted burner cannot behave well unless sufficient space is left between the burner-tube and the mantle-ring for the products of combustion to escape through the annulus. If this annulus is closed up, the burning gas must pass through the substance of the mantle, reducing its illuminating power and often leading to deposition of soot. Moreover, when the annulus is closed, the effect of turning on the tap is to fill the mantle with a mixture of gas and air, which explodes when a taper is applied. Furthermore, if the annulus is so broad that the flame does not actually traverse the mantle, it heats the lower portion of the burner-tube; and this is found beneficial. Burners constructed on these lines were made by Ehrich and Grätz and by the Kramer Company. In the former, the globe round the mantle had a narrow neck at the same level as the metal ring carrying the mantle; the annulus so left being so much smaller in area than the annulus between the mantle ring and the burner-tube that the combustion products were persuaded to escape from within the mantle. The idea also was to diminish the excess of secondary air entering through the holes in the base of the globe, so that the outer surface of the mantle might not be unnecessarily cooled.

When a burner having a parallel mixing-tube is inverted, the increase in volume of the gaseous mixture caused by the heat sets up friction and tends to make the burner smoke and fire-back. To remove this defect, the mixing-tube ought to be cone-shaped, with a steadily increasing diameter; but an almost equally good result is obtained if the mechanically easier method is adopted of widening it step-fashion. In a burner thus constructed by the Auer Company, this plan is adopted; a gauze being fitted in a special enlargement of the tube, while round the tube is fixed an inverted bell into which the combustion products enter, so as to heat the gas and primary air as much as possible. If the tube is widened step-fashion, one or more gauzes may be placed close together near the orifice or else fixed one at each shoulder. The advantage of widening the mixing-tube towards its mouth is shown by the following figures: An inverted gas-burner having a parallel mixing-tube 6·7 inches long by 0·47 inch in diameter was tested with a mantle about 30 minutes old at a pressure of 45 mm. In the upper part of the tube was then inserted a collar 1·8 inches long by 0·36 inch in diameter; and the test was repeated under practically identical conditions, with and without a globe (perforated at its base). The duty of the burner calculated from its horizontal illuminating power when consuming between 95 and 110 litres of gas per hour was 12·2 candles per foot when tested with the parallel tube and without a globe, rising to 14·6 candles when a globe was employed. After fitting the inner tube, the corresponding duties were 16·7 candles per foot without globe and 19·2 with. The figures show not only the benefit of a tapered mixing-tube, but also the advantage of causing the secondary air to impinge against the mantle in a contrary direction to the mixture of gas and primary air.

Burners in which the mixing-tube is heated as highly as possible were also made by B. Smith and Falk, Stadelmann, and Co., of London, and by Happ, of Zürich; the mixing-tube in the latter type being surrounded by two jackets so that the products of combustion ascended in the inner annulus and descended in the outer one. Quite apart from the unsightly appearance of burners having a visible metallic mixing-tube long exposed to a high temperature, and the possible danger that essential parts may sooner or later be entirely eaten away, excessive heating of the burner-tube increases the ascensional force of the descending mixture of gas and primary air to such an extent that the supply of primary air may be insufficient, unless the gas is supplied to the burner at a somewhat high pressure. For these reasons the Auer Company

modified their burner just described—putting round the tube just above its non-metallic outlet a deflecting cone with a cowl-shaped opening at one side. This arrangement prevented the upper part of the mixing-tube from rising to so very high a temperature, and slightly diminished the efficiency of the burner, especially in directions approaching the vertical. But in other respects the change was advantageous. A burner was introduced in 1903 by the Kramer Company in which the mixing-tube, instead of being gradually enlarged in diameter and provided with gauzes, was made throughout its length wider than necessary—being fitted with a narrowed outlet. Half way up, a horizontal deflecting plate was fixed round the tube; but above it a conical jacket was erected polished on the outside so as to retain the temperature of the upper part of the tube at the point naturally reached by conduction. The open mouth of this cone entered into the open base of a small chamber round the primary air inlets.

Some experiments were carried out by Dr. Wedding upon the effect produced by cooling the mixing-tube of a Kramer burner with water. He found that at a constant consumption of 2·1 feet per hour the burner developed a light of from 15 to 20 Hefners, rising to 40 Hefners when the tube became hot. He also found that no appreciable advantage accrued from a temperature above 60°. At this point the mean hemispherical illuminating power of the burner was 42 Hefners; its duty being equal to 18·1 candles per cubic foot.

Burners Heating the Primary or Secondary Air.

Burners having arrangements for pre-heating the primary air are numerous. In the apparatus made by the Kontinental Company, the air is admitted to the mixing-chamber through three tubes, which, curving downwards, are employed to carry the deflector and the globe support. One of these tubes can be partly or entirely closed by a slide at its inlet in order to adjust the supply. As the combustion products rise round these tubes, the primary air is heated before reaching the injector. A similar arrangement is adopted in the Lux and Poulet burners; but regulation of the air supply is there effected by revolving a perforated collar placed at the spot where the inlet tubes join the mixing-chamber. In other burners, the primary air enters through roughly horizontal tubes round which the combustion products play. In the Spreadbury burner, the primary air enters through ascending pipes into a chamber surrounding the mixing-tube of the burner, where it is still further heated by contact with the hot metal before being drawn into the burner tube. In the Bower burner, the flat deflector is formed in the shape of horizontal tubes, through which the air also travels to a jacket round the burner-tube—regulation being effected by rotating one-half of the burner upon the rest.

An unusual amount of preheating occurs in the most recent of the Mannesmann burners. The conical metal cover is in duplicate, leaving a parallel space through which the primary air enters. The combustion products escape through orifices in the double cover in which short lengths of pipe are fixed airtight. This burner has also an arrangement for heating the secondary air. It is provided with a non-perforated globe and an inner glass cylinder open at the base. The secondary air enters with the primary air inside an ornamental jacket at the top of the burner, passes downwards over the outer surface of the upper cover, through a narrow annular space, into the globe, where it has to sweep over the hot surface of the glass cylinder before rising to the flame. In a further modification of the same burner a third hood, closed at the top, is fitted, so that the combustion products, on issuing from the short tubes joining the two interior cones, are compelled to descend again for some distance before passing away. The hoods are made of an aluminium alloy, which does not corrode or become unsightly in use. In a burner made by Maaske, the primary air is heated by causing it to enter through a number of holes at the base of a conical chamber erected directly on the top of the flat burner cover, the upper part of the cone extending to just above the inlets into the burner-tube. As this arrangement is apt to cause too much overheating, a few small holes are drilled in the upper part of the cone, so that a certain quantity of cooler air may enter. A very similar device is met with in the Kramer burner. In the most recent types of these burners, and also in one made by Riemer, the primary air is only moderately warmed; part of the combustion products escaping directly from a lateral opening in the burner, while the rest collect under a hood surrounding a jacket round the burner-tube, through which jacket the primary air travels. Another method of warming the primary air consists in making it enter the burner under the edges of a cylindrical shade placed round the globe; the products of combustion escaping from the globe through enclosed channels.

When an inverted burner is fitted with a globe having an opening at its base, the secondary air becomes heated to some extent as soon as the globe is hot. More powerful heating may be obtained by using a globe having no opening underneath; but the advantage is frequently neutralized by the risk of explosion at the moment of lighting, if the taper is not applied quickly enough. It is now generally agreed that an open globe is better, and that a closed globe can only be used advantageously when some chimney-like device is fitted to the burner to draw the combustion products away. When a closed globe is employed and the secondary air is admitted above its lip, some deflector must be put round the burner so as to make sure that the secondary air enters the globe and sweeps over the mantle. It is easy to incorporate with this arrangement a device for heating the primary or secondary air, or both—making, for instance, all the air enter a chamber above the globe, leading the primary up to the injector chamber through pipes, and directing the secondary downwards to the base of the mantle by a diverging deflector.

(To be continued.)

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

The Annual Meeting of the Association was held last Wednesday, at the Cripplegate Institute—the President (Mr. W. Upton) in the chair.

Before the election of officers for the ensuing year was proceeded with, Mr. Upton said he had acceded to the unanimous wish of the Council to again accept the position of President if elected; while Mr. Ainsworth stated that it was his desire to retire from the position of Senior Vice-President.

The result of the election was as follows: *President*, Mr. W. Upton. *Vice-Presidents*, Mr. D. Winslow and Mr. W. J. Liberty. *Secretary*, Mr. J. G. Clarke. *Auditor*, Mr. Bennett. On the motion of Mr. Walter Grafton, seconded by Mr. H. Rothwell, a vote of thanks was passed to Mr. Upton for the manner in which he had carried out the duties of President during the past year.

It was stated the total membership is now 140; and that the Council had decided that the subscription should be raised from 5s. to 7s. 6d. per annum, such increased subscription to take effect on all members elected from May 15, 1907, and on present members from October, 1908.

The Council reported that they had awarded a prize for the best paper read during the session to Mr. L. F. Tooth, of the Commercial Gas Company, for his paper on "Lighting and Maintenance," which was read at the December meeting, and an abstract of which appeared in the "Journal" for Dec. 25, p. 894.

It was also reported by the Council that a vote by ballot as to the future day of meeting was in favour of Friday, instead of Wednesday as at present. Therefore, until further notice, the meetings will be held on Friday.

It was stated by the President that a visit to the East Greenwich works of the South Metropolitan Gas Company had been arranged for Saturday, June 1; the members to meet at the southern entrance of the Blackwall tunnel at 3 p.m.

SOUTH-EAST OF IRELAND GAS ASSOCIATION.

The Quarterly Meeting of the Association was held in Dungarvan last Wednesday—Mr. George Lennon (Dungarvan) in the chair. There was a good attendance.

Two new members having been added to the roll,

Mr. Jeremiah Grant (Tipperary) read a paper, of a retrospective character, entitled "Differential Prices of Gas and Tabulated Consumptions," in the course of which he dealt with the progress of the undertakings with which he had been associated. He traced the tabulated consumption scheme back to the time of its inception 15 years ago, and pointed out its advantages and drawbacks. He alluded to the fillip given to business by the introduction of slot-meters, and referred to the unsatisfactory nature of the information published in certain gas statistical and similar publications.

In the course of the remarks upon the paper, Mr. D. W. Tooms (Fermoy) said he considered the tabulated consumption scheme wrong in principle and bad in practice, though he admitted that there should be special prices for gas used for cooking, heating, and motive power. He looked upon the slot-meter as great a boon to the gas industry as the Welsbach mantle had been. Mr. T. Hornby (Mallow) said he found the differential tabulated rate unsatisfactory to the consumers and himself; and he thought any differential rates should be regulated by special meters. Mr. J. Paterson (Queenstown) considered differential prices advantageous, if they were upon a proper basis, and with all the consumers on the same basis. Mr. G. W. Norman (Dublin) was of opinion that differential rates were unsatisfactory. Mr. Tyndall (Wicklow) also alluded to certain published gas-works statistics, and said he thought no credence could be placed on the information contained therein, except the manager's name and address. He had personal experience of two works where the information given was totally wrong.

Summing up the discussion, the Chairman referred to the state of Ireland eighteen years ago, when the population was a million more than it was now, and the country was more prosperous. Dungarvan had then nearly twice its present population. At that time coal was cheap, yet gas shareholders received no dividend, the managers and workmen were ill paid, and the concerns were practically in bankruptcy. What had caused the present prosperity of gas undertakings? He considered that the adoption of differential rates, with other factors, had contributed to the existing satisfactory conditions; and although he was not now in favour of tabulated consumptions, he thought the system a very proper one for the time when it was introduced.

Mr. Grant having briefly replied,

A paper dealing with distribution, having special regard to

lighting, was read by Mr. Hornby, and evoked a very animated discussion.

The members were hospitably entertained throughout the day by Mr. and Mrs. Lennon, who were cordially thanked for their kindness.

An invitation was received from the Wicklow Gas Company, through Mr. Tyndall, for the members to hold their next meeting in Wicklow. They stated that large extensions and improvements, estimated to cost about £2000, were in progress; and it was thought the reconstruction scheme would then be in a most interesting stage. It was decided to accept the invitation with thanks, and the date was fixed for the 15th of August.

The Midland Junior Gas Association will, we learn, on Saturday, the 1st prox., pay a visit to the fire-clay works and mines of Messrs. George K. Harrison, Limited, at Stourbridge.

The late Mr. Thomas Henry Goodwin Newton, of Barrells, Henley-in-Arden, a Director of the Imperial Continental Gas Association, whose death was recorded in the "JOURNAL" for the 26th of March, left £279,312.

Injuries caused to iron pipes by the formation of rust, was discussed recently in the "Gesundheits Ingenieur." It is shown that of all metals used for industrial purposes iron is most exposed to oxidization, and is least well fitted to resist the action of oxygen. The various ways in which rusting takes place are described, and special attention is devoted to the "spongiose," or graphitic, destruction of iron, which was first observed by Calvert so far back as 1861, but which has again recently been brought into prominence. By means of micro-photographs, the action of certain substances on this metal is explained. The influence of electric currents, and of minute vegetable growths which flourish in water containing dissolved iron, are likewise examined, and certain precautions which might be observed in the choice of suitable metal for casting purposes are pointed out, as also the influence of various protective coatings, such as paints or varnishes, upon the life of the pipes.

In a recent number of the "Chemiker Zeitung," Herr H. Schlegel and Dr. E. Merkel gave an account of the investigation of three different processes for removing iron from water supplies. The first of these was that of Bock, in which the water is filtered through beechwood wool. This material possesses the advantage that it does not impart a resinous taste to the water, and the filter can be connected directly to the service, as the filtration is carried out under pressure. It was found, however, that this process only removes from 50 to 60 per cent. of the iron, and greatly increases the number of bacteria. In the second process considered, use was made of the "Agga" filter, which is composed of sand; the surface being increased considerably by embedding in it hollow cylinders of fritted glass sand. By this process the quantity of oxide of iron was uniformly reduced from 0·8 or 1 milligramme per litre, down to 0·04 to 0·08 milligramme, and the result was equally satisfactory whether or not the water had been aerated previously. The bacteriological results were much more favourable with this process, as there was only a slight increase in the number of bacteria. In the third process, the water was aerated by allowing it to flow over steps, and was then filtered through fine sand. Here also the removal of the iron was almost complete, and the increase in the bacteria was very slight.

Bids at figures below cost are so troublesome, that most contractors and engineers desire to avoid them; but occasionally some one will make such a bid, and insist on its being accepted. What will generally happen in a case of this sort is well shown by work recently done at Norfolk (Va.), on the coagulating basin and water-mains at the city's pumping-station. According to some particulars given in "Engineering Record," when the work was advertised, the nature of it was investigated by local contractors, who put in bids based on their knowledge of the conditions. A New York Company, however, submitted an offer considerably lower, and the contract was given to them, though it was predicted at the time that they would lose heavily unless weather conditions were particularly favourable. The natural result followed. The Company are now endeavouring to secure from the city payment of at least a part of the losses they incurred through taking the work at a figure which was too low. Up to the time of publishing the particulars, there seemed to be a feeling on the part of the city that there was no reason for paying the extra charges except one, due to excessive rainfall during July and August last, which made the work so unexpectedly expensive that a part of this unusual expense might well be borne by the city. "This case," says our contemporary, "is a typical one; and it is to be hoped that when the final decision is reached, it will be in a spirit of fairness to the local contractors who did not get the work as well as to the city. Wide competition on public works is very desirable; but when that competition brings with it an element of unwarranted low bidding, the advantages of such competition are somewhat reduced. The matter is always in the hands of local officials; for if they invariably insist on the contract being carried out in its original spirit, troubles such as the one mentioned above will be avoided after the rod of discipline has been wielded vigorously once. If contract terms are not made obligatory on the contractors, then the local parties whose better knowledge prevented their making the low bids have reason to complain that they have been treated unfairly."

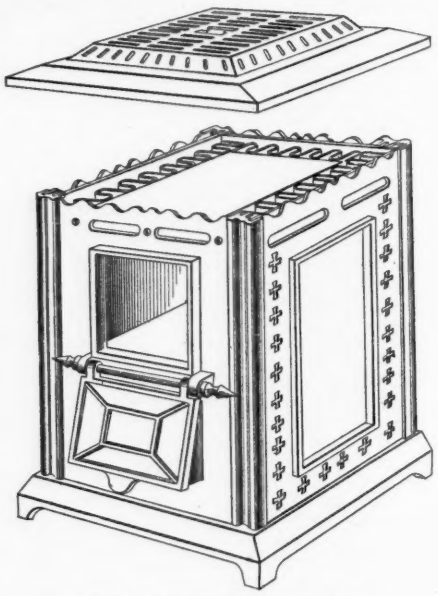
REGISTER OF PATENTS.

Gas Heating and Cooking Stoves.

BOWER, G., of St. Neots, Hunts.

No. 9162; April 18, 1906.

This invention relates to stoves for heating and cooking wherein the source of heat comprises one or more burners giving a white light, so arranged that the flames will not impinge upon any portion of the stove body. In such stoves, as hitherto constructed, where the heat transmitting portions have been ribbed or fluted to better enable them to transmit the heat from the heated mixture of air and products of combustion, the parts have, in some cases, formed the sides of open passages, and consequently only a small portion of the heated gases has impinged upon them; in other cases, a perforated plate, allowing some of the products of combustion to pass and deflecting others, has been placed over the burner.



Bower's Luminous Flame Gas-Stove.

According to the present invention, where the stove is intended for heating, a portion or the whole of the body, or a lining, is formed with vertical hollow ribs exposed on their interior to the heat of, and products of combustion from, the burners, and on their exterior to air. The whole of the products of combustion and heated air is deflected by baffle-plates into the inner concave parts of the ribs as it passes upwards to the top of the stove, where the heated gases may be dispersed for heating, or they may be collected and used for cooking operations, or for heating hot water coils or boilers. When the stove is intended for cooking, similar heat conducting parts are employed; but they are enclosed, partly or wholly, in a casing of non-conducting material. The baffle-plates are replaced by an oven (preferably portable so that it can be removed), and the stove is so used for heating, or for the double purpose of both heating and cooking—the heated products of combustion and air being conducted to, and collected on, the top of the stove, where they may be dispersed for heating or used for culinary purposes.

The illustration gives a perspective view of a cooking and heating stove with the top detached.

Gas Grilling and Boiling Apparatus.

THOMPSON, W. H., of Albert Park, Victoria, Australia.

No. 10,235; May 1, 1906.

The inventor's "first and main improvement" consists of an atmospheric gas-burner of such construction that it may be used either for grilling or for boiling purposes separately or for both at the one time. The second improvement consists in constructing the burner as a fixture upon the top of a four-legged or four-sided frame which has a shelf at its lower part to receive a slot-meter, and another shelf above the meter and below the grilling chamber to hold dishes or other appliances; while, again, at the back of the chamber, and between it and a wall plate or fire-shield, is a space provided with a shelf for heating plates or the like. Other "improvements" consist in details of construction.

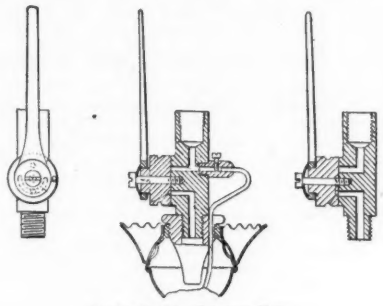
Gas-Burner Taps and Valves.

CARLEY, A. T., of East Sheen, Surrey.

No. 10,332; May 2, 1906.

This improvement in taps or valves, especially applicable for inverted and upright incandescent gas-burners, consists in the taps or valves being either constructed so as to entirely open and close the passage for the gas to the burner, or to open and close the passage to the burner and to simultaneously close or open the passage to a pilot-burner. The burners are of the type in which the valve is partially rotated round a central axis and made with a flat face adapted to be held in contact with the casing by a spring—the casing being provided with a port connecting with the gas inlet and with

another port connecting with the outlet for the gas; both ports being suitably, but not necessarily at right angles, to the valve face.



Carley's Gas-Burner Tap.

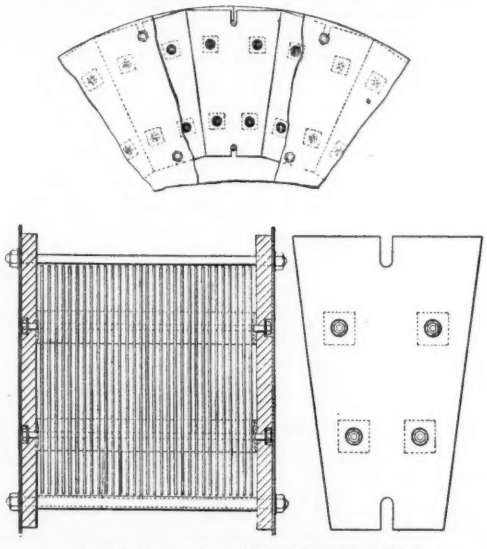
The invention comprises many distinctive features shown in the accompanying illustration.

Washer-Scrubbers.

HERSEY, S., of Palace Chambers, Westminster.

No. 11,004; May 10, 1906.

This invention relates to washer-scrubbers of the kind in which a number of discs rotate in bays or tanks, each disc comprising a number of segments or "bundles" composed of a number of boards held together by side boards made with notches, so that they may be passed on to bolts for building up the discs, which are clamped together at their periphery by bolts passing through notches in the side boards and through the frame plates, and having screw threaded ends to receive nuts.



Hersey's Improvement in Washer-Scrubbers.

The illustration shows the method of fixing the bundles in position; also a section and side view on an enlarged scale.

The boards or plates of which each bundle is built up are separated by distance pieces, and there are side boards between which the plates are clamped by bolts, the heads and nuts of which are countersunk in the side board. The frame plates of the disc for carrying the bundles are mounted upon a shaft or boss and braced together by bolts, upon which the bundles are supported; notches being formed at the inner ends of the bundles in order to fit over the bolts. When the bundles are placed in position on the bolts, other bolts are passed through the frame plates and through notches in the outer ends of the bundles, so as to retain them in position.

Gas Cooking-Stove.

WRIGHT, J. W. B., and DARWIN, H., of Birmingham.

No. 14,974; July 2, 1906.

The patentees claim: A gas-cooker comprising an elevated oven having an opening in the bottom or floor, and an elevated burner below the opening; a removable damper-plate adapted to close the opening, and by which heat is deflected downwards on to cooking utensils or receptacles beneath; supports upon the bottom of the oven adapted to support a utensil over the central opening; side flues communicating at their lower ends with the burner-chamber and at their upper ends with a top chamber surmounted by a hot-plate and provided with removable damper-plates to admit of a vessel being placed immediately over the heated gases. The whole is so arranged that when the oven is not in use for cooking, boiling can be effected by removing the damper-plate and using the flame which heats the oven; while when the oven is in use the damper-plate is inserted in place to close the bottom, and boiling can be effected by the heat conducted round the oven to the hot-plate and through the damper-plate opening.

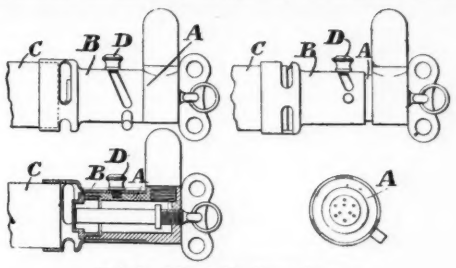
Regulating Atmospheric Gas-Burner.

YATES, H. J., of Birmingham.

No. 16,795; July 25, 1906.

This invention consists in combining with a gas-inlet nozzle and a mixing-tube (arranged to provide an air admission space at its end adjacent to the nozzle) an independent perforated air regulating sleeve mounted upon the nozzle and adapted to slide over the inlet end of the mixing-tube, together with a pin-and-slot device, whereby a combined rotary and sliding motion can be imparted to the sleeve for advancing it towards, or withdrawing it from, the inlet of the mixing-tube.

A side elevation and a longitudinal section of the improved nozzle and air regulating sleeve (in the fully open position), as also a side elevation showing the sleeve in the partially closed position, are given.



Yates's Adjustable Stove Burner.

The nozzle A is of sufficient length to permit of an air-regulating sleeve B being mounted on it. The sleeve is formed at its outer extremity with a perforated enlargement, which can pass over the outer end of the ordinary mixing-tube C of a gas heating or cooking stove. Along the sleeve is cut a spiral slot, through which is inserted a pin or stud D, which is screwed to the nozzle. On rotating the sleeve in one direction (say) by a finger piece, the sleeve is advanced (through the action of the slot and pin) towards the mixing-tube inlet; while a reverse movement effects the withdrawal of the sleeve. The length of the sleeve and the disposition of the perforations in its enlarged extremity are preferably such that, when at the limit of its outward movement, the air supply in the mixing-tube is completely cut off; while at the limit of its inward movement the maximum supply of air is admitted to the tube. By adjusting the sleeve, any required air supply between these limits can be obtained. When adjusted, the sleeve is secured by the stud D.

Incandescence Gas-Lamps.

HARRISON, C. W., of Middlesex Street, E.C.

No. 23,969; Oct. 27, 1906.

This invention relates particularly to incandescence gas-lamps of the kind in which a globe normally encloses the mantles and is adapted to be lowered for cleaning purposes or for the inspection and repair of the mantles; the chief objects being to provide improved means for enabling the globe, when raised from its lowered position, to be automatically retained in its position around the burners, and to provide means for indicating the position of the gas-plug relatively to gas-passages leading to the main burners and a bye-pass or pilot-tube.

Mixing and Supplying Gases.

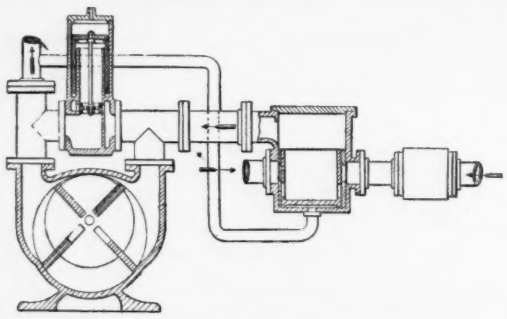
AKTIENGESELLSCHAFT FÜR SELAS-BELEUCHTUNG, of Berlin.

No. 3533, Feb. 12, 1907. Date claimed under International Convention, March 3, 1906.

This invention relates to "a process for mixing and supplying gas and air or other gases," concerning which the patentees say: Processes are known in which, with a continuous operation of the suction and forcing apparatus, the quantities are adapted to the consumption by automatic variation of the cross-section of the admission apertures by means of an admission regulator, either under the influence of the pressure in the supply or forwarding pipe or of the pressure in the suction pipe. Both methods of regulation present defects which are caused mainly by the arrangement in succession of the different operations and regulators. The known appliances are usually provided with a circulation pipe and circulation regulators for the suction and forcing apparatus. Now, if the pressure in the suction chambers is utilized for the regulation of the admission cross-sections, the result is that the pressure in the service-pipe—which, however, varies in the first place with the consumption—must first of all act upon the circulation regulators; while it is only after the circulation pipe has been acted upon, and the suction pressure modified owing to this action, that the admission regulator is adjusted. Attempts have also been made to influence the admission regulator directly from the service-pipe, but without eliminating the arrangement in series of two regulators relatively to the service-pipe.

In accordance with the present invention, on the one hand the admission regulator and, on the other hand, the circulation regulator, are influenced simultaneously and independently of each other in parallel arrangement from the service-pipe, while the pressure in the suction-pipe is regulated or maintained at a given magnitude owing to the fact that the two regulators mutually co-operate. The circulation regulator is doubly influenced from the service-pipe—that is to say, once directly and once indirectly—by the admission regulator, which is likewise influenced by the service-pipe. The process may be considered as the influencing of the admission regulator by two oppositely-directed cycles of force, both of which have their origin in the service-pipe and pass through the suction-pipe and through a branch pipe of the service-pipe. In other words, the admission regulator is inserted in two different oppositely-acting cycles of force, the difference of whose actions is utilized for adjusting the admission cross-sections.

By means of the invention, numerous important advantages are said to be obtained. It permits of a more complete and more sensitive regulation of the inlets, and, in addition, a more efficient control and regulation of the operation as a whole, and a simplification of the reversing parts. The greater sensitiveness of the adjustment of the inlets is due, in the first place, to the fact that the admission regulator is subjected to the speediest possible action of the differences of pressure prevailing for the time being between the suction pressure and the pressure in the service-pipe. The admission regulator, which is ordinarily a piston slide valve, may likewise be made of smaller diameter, whereby the friction is reduced so that further sensitiveness is obtained. As a result, the piston slide valve may be made very solid. The sensitiveness is further increased because it is not necessary to form a completely tight joint. Even if it is possible for small quantities to be transmitted from the pressure-pipe into the suction-pipe by the admission regulator, this would hardly affect the operation.



A Selas Light Regulator.

The inequalities and irregularities due to successive operations of the two regulators are eliminated. The change of pressure in the forwarding pipe exerts such an influence upon the admission regulator, at the moment at which it influences the circulation regulator, that the influence of the suction-pipe pressure on the admission regulator is partially eliminated, so that there is a certain counter-force which serves as a means for obtaining a constant adjustment of the freely-floating piston and for preventing it from chattering. Owing to this influence, it is possible to make the regulator part (slide valve, cock, or the like) very easy fitting. It is also possible by means of the arrangement to keep the vacuum in the suction-pipe very small; it need only be sufficient to prevent the gas from escaping through the air aperture during the suction.

A number of examples of construction for carrying the process into practice are illustrated in the patent specification; and one form (with a common admission regulator for the gas and air) is given herewith.

APPLICATIONS FOR LETTERS PATENT.

16,910A (1906).—JOHNSON, G. W., "Effecting the removal of impurities from gases." A communication from Verein Chemischer Fabriken. May 10.

10,482-3.—REHMANN, H., "Gas-generators." May 6.

10,506.—FISCHER, H., "Double mantle." May 6.

10,507.—FISCHER, H., "Mantle with two double head parts for hanging incandescent gaslight." May 6.

10,523.—ROOK, G. E., "Non-freezing device for gasholders." May 6.

10,606.—SIMMANCE, J. F., and ABADY, J., "Photometrical apparatus." May 7.

10,633.—SNELL, F. A., "Heating burners." May 7.

10,655.—WEBER, G., "Gas-stove." May 7.

10,752.—MÜNZEL, M., "Purifiers." May 8.

10,790.—BROWN, D. J. K., and PATTERSON, J., "Connections suitable for lead piping." May 9.

10,791.—BOGGIS, J. A., "Boilers for gas-stoves." May 9.

10,804.—DIXON, W., "Process for the treatment of bituminous coal, to render it practically smokeless when burning, and for the recovery of bye-products therefrom." May 9.

10,837.—STERN, M., "Fittings for gas." May 9.

10,867-8.—EWART AND SON, LIMITED, and EWART, G. H., "Water-heaters." May 9.

10,874.—WASMUTH, A., "Mantles." May 9.

10,893.—HALLIWELL, F., and R. & J. DEMPSTER, LIMITED, "Guide-rails for spirally-guided gasholders." May 10.

10,900.—SCOTT, J. W., and R. & J. DEMPSTER, LIMITED, "Lutes of telescopic gasholders." May 10.

10,911.—FISK, J. W., "Incandescent gas-fittings." May 10.

10,958.—TOURTEL, J. N., "Tap for gas." May 10.

10,975.—EDGAR, W., "High-pressure lighting." May 10.

10,980.—HUMMEL, H. J. J., "Inverted gas-lamps." May 10.

11,047.—CAHILL, D., "Liquid meters." May 11.

11,064.—STRAIN, J. J., "Hot-water service attachment to the burners of gas-stoves or gas-rings." May 11.

The Ascot Gas Company and their Electric Lighting Plant.—Under the powers confirmed by the shareholders of the Ascot District Gas and Electricity Company at their recent meeting, tenders have now been accepted by the Board for the new plant required for the electric section. For two gas dynamos and producer plant, Messrs. Bilbie, Hobson, and Co.'s tender (for Hornsby engines and Johnson and Phillips's dynamos) amounted to £2669; for the switchboard and booster, the Electric Construction Company are to receive £862; and for the cables, Messrs. Siemens Bros. were successful at £9444. A few minor tenders were also arranged for—all to the specification of Messrs. Handcock and Dykes.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Imperial Continental Meters and Consumers.

SIR,—I beg to call your attention to a slight mistake that has been made in your editorial notes on the proceedings at this Company's last half-yearly meeting.

The Directors' report to the shareholders stated that the "total number of meters" increased by 42,780. This includes an increase of 16,707 in prepayment meters; so that the increase in ordinary meters was 26,075. You appear to have overlooked the word "total," and therefore assumed that the first-mentioned figure referred only to ordinary meters.

The number of consumers increased by 38,652; so that there was a difference of 4128 between the increase in the total number of consumers and the increase in the total number of meters.

This difference, I need perhaps not explain, arises from the fact that, in the majority of the towns supplied by this Company, gas used for heating, motive power purposes, &c., is sold at a lower price than for lighting, with the result that numbers of consumers have more than one meter.

ROBT. W. WILSON,
Secretary.

Imperial Continental Gas Association,
21, Austin Friars, E.C., May 15, 1907.

Laying Mains on Railway Bridges.

SIR,—Your note on p. 439 of the last issue of the "JOURNAL," with regard to laying mains on railway bridges, prompts me to relate my experiences bearing upon the subject.

Like others, I have experienced the difficulties of arranging for extensions of mains in districts where bridges support the highway, owing to the practice in the past of providing for as little substance as possible between the road surface and the upper structure of the bridge, whether masonry or steel—this practice often necessitating the diversion of the main and its support on brackets on the exterior of the structure.

Seven or eight years ago, considerable railway extensions were projected in this locality in connection with the harbour and dock extensions, and many new bridges required to be built. I advised my Commissioners at the time to take steps to compel the promoters of such road disturbances to make reasonable provision in their structures for the carrying of pipes without exposing them unduly to the passing traffic—basing my advice on the common fact that we already had statutory authority to use the roadways for public purposes, and that any other party desiring to interfere with the roadway should be called upon to make reasonable provision for such public services as gas, water, electricity, &c.

At the outset, the promoters of such schemes objected to our demands; but one or two petitions against their Bills in Parliament were sufficient to induce them to undertake to make provision for such mains as then existed, and also such as might be reasonably thought would be necessary for the supply of the locality in the future, as well as providing for the laying of pipes where they did not at present exist. We now have little difficulty in arranging for the protection clause as appended being inserted in all Railway and similar Bills.

> "For the protection of the Edinburgh and Leith Corporations' Gas Commissioners (in this section called the 'Gas Commissioners') the following provisions shall, unless otherwise agreed between the Company and the Gas Commissioners, have effect:—
>
> "(1) In the construction or widening of any bridges carrying roads over any of the railways by this Act authorized, the Company must so arrange that there shall be a sufficient space between the crown of the arch or top of the girder work and the road surface, or that other suitable provision shall be made, for the laying of any mains, branch, or service pipes that may be necessary not only for the present but also for any future reasonable requirements of the Gas Commissioners: Provided that the diameter of the largest pipe to be so laid shall not exceed 18 inches."

I may say it is now a practice in this locality for the railway companies and the different authorities to exchange plans of proposed new bridges, and mutually arrange for the various public services for which the highways are called upon to provide, and further that such provisions timeously arranged add little, if any, to the cost of the structures, and confer considerable advantages upon the public at large.

W. R. HERRING.

Edinburgh, May 17, 1907.

The Margate Borough Surveyor and his Circular of Inquiry.

SIR,—I duly received copy of "JOURNAL" and noted the comments upon my action in asking for information upon certain points in connection with the manufacture of coal gas.

At the outset, I would like to point out that the relations between Mr. Winstanley and myself have always been most friendly; and I do not think there is any ground for expecting that such relations will not continue. When I sent out the queries, I had not the slightest intention of reflecting upon Mr. Winstanley in any possible shape or form. In fact, it was through Mr. Winstanley's offer to me, to consider any suggestion I wished to make to him, that led me to seek the information. I can now see that, before sending out the queries, it would have been correct to have asked him whether he had any objection to the questions.

I sent out the papers quite openly—not marked "Private" or "Confidential"—and really, when I issued the papers I did so just as all municipal engineers do when seeking information from each other. I myself have had no less than four papers sent to me this week, on such divergent subjects as "Gas Lighting of Streets," "Fire Brigades,"

"Sewage Disposal," and "Refuse Disposal." The first two will no doubt be answered by the officials in charge of those branches, and the latter by myself. Some of the gentlemen whom I wrote to, *re* gas-works, answered my questions in a most friendly manner; others respectfully declined; while some refused to answer at all. To those who did answer, I wish to assure them that the information supplied was not sought for with a view to getting advice "free gratis," and using same in any way that they would object to; but simply, as previously stated, my sole object in sending out the papers was to obtain information on points which I thought affected the matter.

Mr. Winstanley and myself met yesterday, and again to-day, and I am pleased to inform you that we did not quarrel, and, further, we did not fight—we parted the best of friends. We are both deeply interested in the welfare of Margate; and that, in itself, is quite sufficient to promote friendly relations between us.

With reference to the personal portion of your article, I naturally think you were unfair; but doubtless you were under the impression that my action in writing for information was unprofessional, and out of order. To that, I think I have said quite enough.

I am a member of the Incorporated Association of Municipal and County Engineers—both by election and by examination; a member of the Royal Sanitary Institute of Great Britain; an associate of the Association of Water Engineers; a certified lecturer upon two technical subjects closely connected with my profession; and, last but not least, have had nearly twenty years' experience in the calling of a municipal engineer and surveyor. I do not think it necessary to say another word upon this matter, except that, if I have done anything which could be called improper, I regret it very much indeed, as such was not my intention.

ERNEST A. BORG.

Borough Surveyor's Department,
Margate, May 17, 1907.

Sales of Stocks and Shares.

Acting under the instructions of executors, Mr. Alfred Richards sold at the Mart, Tokenhouse Yard, E.C., on Monday last week, a number of parcels of stocks and shares. The first lot consisted of consolidated "B" stock of the Wandsworth and Putney Gas Company, ranking for a standard dividend of 3½ per cent., subject to the sliding-scale, but carrying 6½ per cent.; and it fetched £135 per £100 of stock. Some 3 per cent. perpetual debenture stock of the same Company was sold at the rate of £80 per £100. A parcel of "A" stock of the Barnet District Gas and Water Company, ranking for a maximum dividend of 10 per cent., but carrying 7½ per cent., fetched £165 per £100; some "D" stock (water), carrying 5¼ per cent., fetching £119 to £121, and some 4 per cent. consolidated perpetual debenture stock from £100 to £103. A few fully-paid £10 "C" shares (7 per cent.) in the Harrow and Stanmore Gas Company realized £14 5s. to £14 10s. apiece, *cum div.* Some consolidated "A" stock of the Croydon Gas Company, carrying 14½ per cent., was sold at £300 per £100. A small quantity of general capital stock of the King's Lynn Gas Company, ranking for a standard dividend of 10 per cent., but carrying 7¼ per cent., fetched from £144 to £145 per £100. A little consolidated ordinary 7 per cent. stock of the Peterborough Gas Company was sold at the rate of £151 per £100; six £10 fully-paid new "A" 5 per cent. preference shares at £11 each; and some 4 per cent. perpetual debenture stock at par. A few £10 shares in the Grays Gas Company, Limited, carrying 8 per cent. per annum, fetched £16 5s. each; and some "B" shares (7 per cent.), carrying £5 12s. per cent., £10 10s. to £11 apiece. Fully-paid ordinary £5 shares, ranking for maximum dividends of 10 and 7 per cent., but all carrying 4 per cent., realized £4 10s. and £4 5s. each. Some fully-paid £5 original shares (10 per cent.) in the Harwich Gas Company fetched £9 10s. to £9 17s. 6d. per share. New ordinary stock of the Wolverhampton Gas Company, carrying 6½ per cent., was sold at £126 per £100. The last item in the particulars was £200 of consolidated "C" stock of the Harrogate Gas Company, ranking for a standard dividend of 7 per cent., but carrying one at twice this amount; and the stock fetched from £270 to £272 10s. per £100. A few £10 shares in the Crowborough Water Company were recently sold by public auction at Chichester at £7 5s. each. At Pontardulais, a few days ago, Mr. W. J. Rees offered for sale 600 £5 shares in the Pontardulais Gas Company, Limited; and they fetched from £5 3s. to £5 12s. each.

The Collection of Money from Slot Meters.—When two lads were fined for stealing 9d. from a prepayment gas-meter belonging to the Newcastle and Gateshead Gas Company, which was in an empty house, the Chairman of the Bench (Mr. Michael Powell) said he thought a certain amount of the blame in this and similar cases was attributable to the Gas Company, who, in his opinion, were too long in clearing the meters after tenants had left houses.

Slot Meters at Rickmansworth.—The Rickmansworth Gas Committee have decided that no more slot meters are to be connected until the Council are in a position to reconsider the matter. The reason for this is stated to be that the capital cost is such that it does not pay at the present time to embark on so heavy a outlay; the profit not being sufficient to meet the necessary repayments. The Consulting Engineer (Mr. Frank Jones) has recommended, with reference to the Chorleywood extension, that separate tenders should be invited for the pipes and for the laying of them.

London County Council and Gas and Meter Testing.—At the meeting of the London County Council last Tuesday, an estimate was presented by the Public Control Committee of the London County Council for gas-testing expenses of £4415, and for gas-meter testing expenses of £8860. Colonel Welby regarded it as confusing to put the whole of the charge for gas-meter testing expenses in the £8860, and not to show the amounts which were paid as fees and to officials as fixed salaries. He pointed out that the salaries had increased by £115; while the fees received had somewhat decreased. He asked how many meters had been tested from year to year, and whether this large sum was really necessary. No answer, however, was given; and the estimates were approved.

PARLIAMENTARY INTELLIGENCE.

GAS COMPANIES AND COMPULSORY PURCHASE.

The Hull Corporation Bill in the Commons.

In the House of Commons on Monday last week, on the order for the consideration of the Kingston-upon-Hull Corporation Bill, a debate arose on the principle of payment for compulsory purchase of gas undertakings.

Mr. FERENS moved the insertion in the Bill of the following proviso to clause 5:—

> Provided also that no allowance shall be made for compulsory sale, but the arbitrator, arbitrators, or umpire, who shall determine such price or consideration (in this section called "the Court"), may make such allowance as they think just for recoupment of any loss of interest pending reinvestment, as well as for the cost of reinvestment, and for covering any costs, charges, and expenses (other than costs incurred in any arbitration under this Act), which have been, or are likely to be, incurred in consequence of the passing of this Act by the Company or the stockholders therein, and which ought, in the opinion of the Court, to be borne by the Corporation.

He explained that the Hull Corporation had for many years intended, when a favourable opportunity occurred, to buy up the East Hull Gas Company—one of the three sources of the town's supply. In the last session of Parliament, the Company promoted a Bill to raise a large additional amount of capital. The Corporation opposed, upon the ground that they should have an opportunity of purchasing the undertaking; and, at their instance, the House of Commons Committee inserted a clause providing that if the Corporation promoted a Bill this year the fact of the Company having obtained their Act should not in any degree whatever affect the price to be paid for the gas undertaking if the Bill became law. The Bill, under which the Corporation now sought to purchase, proposed that, in case the two parties could not agree as to the price, it should be referred to arbitration under the Lands Clauses Acts. It was well known that these Acts invariably favoured the vendor; and the practice had been to grant an additional allowance for compulsory purchase, amounting often to 10 per cent., where the subject-matter was the purchase of land or buildings. The reasons for this additional allowance were: (1) That there might be some difficulty in actually determining the value of the land, and (2) that where the land had been family property for many years, and there was a sentimental attachment to it, a solatium was due in consideration of this. These reasons, however, had no application in the case of a gas company. It would be the easiest possible thing here to arrive at the exact value of the undertaking, because the dividend was limited to 7½ per cent. by Act of Parliament. The question of a solatium for sentimental reasons also could not apply in the case of gas shares. His amendment accordingly proposed to exclude any allowance for compulsory purchase. But, in order to treat the shareholders with every consideration, it further provided that the arbitrators were to allow for the recoupment of any loss of interest pending re-investment, and for any other costs incurred in the re-investing of the capital. The proviso which he now proposed was taken practically word for word from the Metropolitan Water Act, 1902, under which the eight large Water Companies were absorbed. The Act was a Government measure; and it seemed to him that what was good enough for eight large Water Companies in the Metropolis was surely good enough for a small gas undertaking in Hull. The proviso was included in the original Bill, which passed the second reading. Apparently the Police and Sanitary Committee objected to it, not so much on its own merits perhaps, as on the ground that, by inserting it, they would make a precedent which they were not prepared to make. The Chairman of the Committee (Mr. Corrie Grant) said: "If you came to me as a legislator—I am speaking now, of course, personally, and not at all as Chairman of this Committee—if you came to me and asked me to vote for the second reading of a Bill proposing something of this kind, I should give you an entirely different answer from the answer I should give you as a Member of this Committee. As I understand this Committee, it is bound by precedent; and it is only entitled to make a new precedent where a case of public necessity or local necessity is made out." In announcing the decision of the Committee, the Chairman said: "If this clause were allowed, in the opinion of the Committee it would be the creation of a precedent in the matter of compensation, which, they think, if it is to be created at all, must be created by Parliament itself in a Public Bill." He (Mr. Ferens) did not bring forward this amendment in antagonism to the Committee, but to give the House the opportunity of doing what the Committee felt was more than they ought to undertake. There they were sitting as legislators; and it was the only opportunity which the House would have of considering the proposal.

Sir H. SEYMOUR KING seconded the amendment. He said that the Committee acted strictly within the limitations that the precedents of Parliament had imposed upon them; but they were now considering the matter in a different atmosphere. It was not the business of Committees to create precedents; it was the business of the House. They all knew how corporations were bled every time that they attempted improvement. In this case the Corporation of Hull asked for nothing but justice between themselves and the shareholders. The Gas Company were absolutely prohibited by Parliament from receiving more than 7½ per cent. from their stock. It could not be said, if the shareholders received for all time the equivalent of that, that any injustice would be done to them. Why should they get an additional sum for compulsory purchase? They would not get it if the shares were in the market; but because it was the Corporation who were purchasing, they were to pay 10 per cent. more than anybody else would pay. And on whom would it fall? On the ratepayers. And for all time the consumers of gas would have to pay a higher price.

Mr. RAWLINSON opposed the amendment because it formed a dangerous precedent. There was a well-recognized procedure which had existed since the Lands Clauses Act of 1845—namely, that where anybody wished to take property belonging to anybody else, 10 per cent. should be allowed to the holder of that property for compulsory sale.

It was suggested here that a precedent should be created which had never found a place in a Private Bill. The Metropolitan Water Bill was a Public Bill; and it was no ground for introducing a grave altera-alteration of the law in a Private Bill.

Mr. G. ROBERTS having spoken in support of the amendment,

Mr. CORRIE GRANT, the Chairman of the Police and Sanitary Committee, said he desired to make a little more clear to the House the question which they really had to decide. Ever since the Lands Clauses Acts were passed the practice had been followed of allowing something, but not necessarily 10 per cent., for compulsory sale. The practice was established long before municipalities began to be purchasers. Land was bought by railway companies from owners who did not wish to sell; and the theory was that this allowance for compulsory purchase was originally put in partly because the owner had to sell his property against his will and partly to cover any element of value which might have been overlooked. But, in later times, when municipalities purchased, the Lands Clauses Acts applied to them; and they had been applied in the House to every case of gas and water purchase until now, except in the instance of the Metropolis Water Act, 1902, which Mr. Fitzgerald, the Counsel for the promoters, himself admitted to be an exceptional case. Since 1902 there had been numbers of gas and water purchase Bills before Parliament; but in none of these had the Metropolitan clause been put in. He was not saying for a moment that there was not a case to be made out for alteration of the practice; but if it was to be altered, then it ought to be done by a Public Act, on which the arguments for both sides could be fairly stated. The whole matter should be fully considered by the House and the Government; and then for the future everybody would have warning, and would know what was to be the terms on which their property was to be taken.

Mr. LUKE WHITE quite agreed that the Committee had no power to make this alteration of practice. But the House itself had full power, and had made a precedent in the case of the Metropolis Water Act. Although that was a Public Bill, he saw no difference in principle between a Public Bill and a Private Bill where the circumstances were the same; and the House was fully competent to consider this question on its merits. He thought, for his part, that the Hull Corporation, in consenting to the clause now before the House, were dealing not fairly and equitably only, but even generously with the Company.

Sir F. POWELL, Bart., said a point which was often forgotten in regard to compulsory purchase was the great inconvenience and loss occasioned by having to sell compulsorily. He considered that for the trouble, risk, and expense of re-investment of capital some compensation ought to be made. The customary allowance on this account should be granted, and he hoped the House would support the action of the Committee.

Mr. J. W. WILSON, a former Chairman of the Police and Sanitary Committee, supported the action of that tribunal, not because he thought that in all cases this particular clause for compulsory purchase was a desirable thing, but because it had been recognized as between one body and another seeking parliamentary powers for compulsory purchase that this would be a condition laid down by Parliament. He was not afraid to depart from precedent; but if he did so, he liked to have a strong case for it, so that the revised precedent would be followed in future. If this amendment were passed, he did not think it would become a precedent of Parliament. In this case, the Corporation acted with their eyes open, and knew they were buying a profitable undertaking. Where compulsory purchase did seem often to act hardly was where a public body were seeking to purchase in the interests of public health, or of the housing of the working classes; and he could remember cases where the Committee had given way in this respect. It might be right to overthrow a precedent of this sort; but he contended that it ought to be done by a Public Bill, after which both parties would have ample notice beforehand of the conditions upon which they treated.

Mr. C. NICHOLSON supported the action of the Committee, who were perfectly right in striking out this particular clause. At the same time there was a certain amount of danger of Committees being rather overruled by legal precedents. He thought there was too great veneration for the precedents set in past years, and too little adaptability to the needs of the time, as they arose. It was desirable, however, that the House should decide this matter once and for all; and he considered a proper line of distinction should be drawn between the purchase of lands and the purchase of undertakings in which the interests of the shareholders were purely financial. It made very little difference to a shareholder whether he drew his income from one source or another, so long as that income was secure. Personally, he hoped the House would adopt this clause, believing as he did that the shareholders would be amply compensated for any loss they would incur.

Mr. BOWLES thought every member must agree that if they were to make an absolute reversal of a fundamental part of the procedure of the House, now 60 years old, it ought to be done by Bill before a full House, and not after an hour's debate. The adoption of this clau-e would introduce a new, far-reaching, and dangerous principle into the consideration of Private Bills.

Mr. JOHN BURNS said it was perfectly natural that the members representing Hull should ask for exceptional treatment for the borough. If that was done in the right way, at the right time, and with reasonable notice, perhaps there was more to be said for their claim than could be stated that evening. But the merits of this proposal were embodied in the Corporation's Bill, and the clause was struck out by the Committee after a full hearing, notwithstanding which the members for Hull persisted in appealing to the House to do what the proper tribunal, after reviewing all the circumstances, had declined to do. The "common form" in all Private Bills for the acquisition of property was under the terms of the Lands Clauses Act, which allowed a certain sum for dispossession and disturbance; and in all cases since 1845, except the very exceptional one of the Metropolis Water Act, this general rule had been adhered to. It was claimed that the Metropolitan precedent should apply to this Private Bill. His answer to that was that that Act did not apply. That was a Public Bill of an exceptional character. The subject with which it treated was one of great magnitude; and the whole circumstances concerning the London Water Companies, which were valued at nearly 40 millions, were such that only a Public Bill would enable the Companies to be acquired. If that precedent were applied to this Bill, every other Private Bill before the House ought to be similarly treated; and even if that were done, it would not meet the case of Bills already passed. Why should Hull get unique and exceptional treatment by way of a Private Bill? To vary the present practice in such a way would disturb the conditions under which all municipalities had acquired their properties and trading concerns; and this isolated and exceptional precedent would be dangerous. He admitted that the Lands Clauses practice might be too generous; it might be onerous to intending purchasers. But if it was to be altered, they should alter the Standing Orders of the House, or else, by Bill, amend the Lands Clauses Act. If this were to be done, as it might have to be done, it would facilitate the transfer of monopolies, now in the hands of private interests, to municipalities more readily than if the existing rule were suddenly varied, without proper notice, after 60 years. No one could accuse him of being indifferent to the interests of municipalities. On the contrary, few men in so short a life had done more to transfer private concerns to public bodies. He had always believed in it. We were all collectivists by compensation nowadays—he had adhered to that view because he thought it the line of least resistance. But if they embarked upon a public policy otherwise than by a Public Bill to be voted by both Houses, they would make the task of the acquisition of private properties by public bodies more difficult in the future. Any such step as the alteration of the Standing Orders, or the modification of the Lands Clauses provision, ought only to be made on the responsibility of the Government. As a responsible Minister, it was his duty, in the interest of fair and just treatment of the municipalities, to say that it would be against public policy, and against the easy transfer of private enterprises upon fair terms to municipalities, if they had a snatch vote in this way on this subject. There ought to be some reasonable continuity in matters of this sort.

The House divided; and the voting was: For the amendment, 73; against, 123; majority against, 50.

UNOPPOSED BILLS.

Maidstone Gas Bill—Heywood and Middleton Water Board Bill.

Lord Onslow, the Lord Chairman of Committees of the House of Lords, had under consideration, on Tuesday last, the Maidstone Gas Bill, which proposes to extend the limits of supply of the Company and for other purposes, and the Heywood and Middleton Water Board Bill, the object of which is to extend the time-limit fixed by the Heywood and Middleton Water Board Act, 1901, for the construction of water-works, to confer further powers upon the Board with respect to their water undertaking, and for other purposes. Both Bills were ordered to be reported with amendments.

PUBLIC COMPANIES AND MUNICIPAL EXTRAVAGANCE.

In the House of Commons last Tuesday, the President of the Board of Trade (Mr. Lloyd-George) replied to a question which Mr. Wiles, the Member for South Islington, had some days previously put upon the paper, as to whether his attention had been called to the fact that the South Metropolitan Gas Company made a contribution to the funds of the London Municipal Society previous to the late London County Council election; and, if so, if he was in a position to state the amount of the contribution. Mr. Lloyd-George said he had been informed that the Company subscribed £21 to the funds of the Society in January last; and he submitted a copy of the following letter:—

South Metropolitan Gas Company,
709, Old Kent Road, S.E., May 8, 1907.

The Assistant-Secretary, Harbour Department, Board of Trade.

Sir,—In reply to the question anent a subscription to the London Municipal Society in your letter of the 1st inst. which was read at my Board to-day (being their first meeting after its receipt), I have to say that this Company subscribed £21 to that Society in January last.

In response to your further inquiry for any observations the Directors may have to make on the subject, I am instructed to say that this Company is one of the largest ratepayers in South London, paying £88,000 a year in rates, being an increase of 50 per cent. in the last seven years. Under the operation of the sliding-scale, as applied to gas companies, whereby gas shareholders and gas consumers are made partners, gains or losses are divided in the proportion of about 6½ to the consumers to 1 to the shareholders. Consequently, of this large sum about 86 per cent., or £75,000 a year, is paid by the consumers, the predominant partner.

Parliament having, by the sliding-scale, united the interests of consumers and shareholders, it is the duty of the Company, as well as its interests, to do the best for both parties by economizing in every possible way. It is to the advantage of the consumers, who are all ratepayers, as well as that of the Company's shareholders and its employees, who are also shareholders, that the waste and extravagance of the local authorities should be checked, and that honest and capable men should be elected on public bodies to secure economical and efficient management; for efficiency cannot be separated from economy. The Directors consider it their duty to adopt all lawful means to that end; and they believe the action they have taken is for the public good.

I am also instructed to direct attention to the gross injustice which the continuance of the present system inflicts on all joint-stock companies. They pay a very large and increasing portion of the rates, with no control whatever over their expenditure, and with no voice or vote in the election of the London and borough councillors or the members of the Boards of Guardians. Such taxation without representation cannot be justified. The system, or rather the want of system, has been allowed to grow with the growth of joint-stock companies, and a remedy is urgently needed to give them their proper share in municipal government.—I am, &c.,

(Signed) FRANK BUSH, Secretary.

HOUSE OF LORDS.

The following further progress was made with Bills down to the rising of the House on Thursday for the Whitsuntide recess:—

Bill brought from the Commons, read the first time, and referred to the Examiners: Kingston-upon-Hull Corporation Bill.

Bills read a second time and committed: Boston Spa Gas Bill, Brighouse Corporation Bill, Shanklin Gas Bill, Worthing Gas Bill.

Bills reported, with amendments: Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water-Works Bill, Coventry Corporation Water Bill, Heywood and Middleton Water Board Bill, Keswick Urban District Council (Water) Bill, Maidstone Gas Bill, Pontypridd Urban District Council Bill.

Bills read the third time and passed: St. Neot's Urban District Council Bill, Tynemouth Corporation (Water) Bill.

The East Preston Rural District Council, the Goring Parish Council, and various owners, lessees, and occupiers, have petitioned against the Worthing Gas Bill.

HOUSE OF COMMONS.

METROPOLITAN WATER BOARD AND THEIR EMPLOYEES.

Colonel LOCKWOOD asked the President of the Local Government Board whether he was aware that the Metropolitan Water Board were endeavouring to evade the provisions of section 47, sub-section 1, of the Metropolis Water Act, 1902, by forcing their transferred officers and servants to sign away their rights and privileges granted them by that Act under a threat of not granting them any increase of salary or wages unless they did so. He also asked if the right honourable gentleman was aware that Lord Balfour, the Chairman of the Joint Select Committee on the Metropolis Water Bill, stated that the Committee's desire would be to put them in absolutely the position which they might reasonably look forward to if there had been no such Bill, and that this was endorsed by the Counsel to the Local Government Board, the promoters of the Bill. He wished to know whether the right honourable gentleman had any jurisdiction in the matter; and, if not, whether he would consider the advisability of introducing, in any similar Bills in the future, a right of appeal by the parties concerned to the Local Government Board.

Mr. JOHN BURNS, in reply, said he had made inquiry on the subject, and was informed that, where an officer transferred from one of the Water Companies to the Water Board was promoted to a higher office or greater emoluments than he was entitled to under the terms of his service with the Company, the Board imposed a condition that the advantages given to him should not at some future time be made a ground for claiming also additional superannuation or like allowance, to which he would not have been entitled under the terms of his service with the Company. He was aware of the statements made by Lord Balfour and by the Counsel for the Local Government Board on the Metropolis Water Bill; but he found that the Water Board did not regard their action as forcing the transferred officers and servants to "sign away their rights and privileges" under the Act. He had no jurisdiction in the matter; but he would note the suggestion of the honourable member.

The following further progress was made with Bills down to the rising of the House on Thursday for the Whitsuntide recess:—

Lords Bills read the first time and referred to the Examiners: Great Yarmouth Water-Works and Lowestoft Water and Gas Bill, St. Neot's Urban District Council Bill, Selsey Water and Gas Bill, Southport, Birkdale, and West Lancashire Water Board Bill, Tynemouth Corporation (Water) Bill.

Lords Bills read a second time and committed: Birmingham Corporation Water Bill, Southend Water Bill.

Lords Bill reported, with amendments: Newquay and District Water Bill.

Bill read the third time and passed: Kingston-upon-Hull Corporation Bill.

TYNEMOUTH CORPORATION WATER BILL.

House of Lords Committee.—Monday, April 29.

(*Before the Earl of* LAUDERDALE, *Chairman, the Earl of* CATHCART, *the Earl of* CARNWATH, *the Earl of* VERULAM, *and Viscount* COLVILLE of CULROSS.)

This Bill was promoted by the Corporation of Tynemouth. Its object is to extend the area of supply of the Corporation; to enable the Local Authorities within the extended area to require the Corporation to supply them in bulk; and to authorize the construction of certain additional water-works.

The Hon. J. D. FITZGERALD, K.C., Mr. LEWIS COWARD, K.C., and Mr. HUTCHINSON appeared for the promoters. The petitioners were: The Ashington Urban District Council, represented by Mr. HONORATUS LLOYD, K.C., and Mr. R. S. CLEASE; the Morpeth Corporation, by Mr. LLOYD, K.C., and Mr. DILL; the Duke of Portland, by Mr. MOON, K.C., and Mr. CHARTERIS; the Ashington Coal Company, by Mr. VESEY KNOX, K.C., and Mr. L. MACASSEY; the Tynemouth Rural District Council, by Mr. J. G. TALBOT, K.C.; the Morpeth Rural District Council, by Mr. E. SHORTT; the Milburn Estates, Limited, by Mr. BERNARD WILKINSON; the Cramlington Urban District Council, by Mr. MOON, K.C., and Mr. ACWORTH; the Bedlingtonshire Urban District Council and Northumberland County Council, by Mr. BALFOUR BROWNE, K.C., and Mr. FORBES LANKESTER.

Mr. FITZGERALD, in stating the case on behalf of the promoters, said that in the year 1786 a Water Company was established, known as the North Shields Water Company; and from that date till 1897 the water was supplied by the Company. The supply of the Company, however, became inadequate—partly because of the increased demand and partly because of the failure of their sources of supply. In 1896, a disastrous fire occurred in Tynemouth; and although the fire-engines were on the spot almost immediately, when they came to examine the water-mains there was no water to be had. It was then that the Corporation felt it their duty to undertake the supply of the borough. In the following session, they promoted a Bill to acquire the undertaking of the Company. The Bill was passed by a Committee of the House of Lords, and they set to work at once to see if they could make arrangements for a supply from the Newcastle and Gateshead Water Company; but the Company were not in a position to supply, and were unwilling to undertake the matter. Without further negotiations, the Corporation decided to go in for an independent scheme. They promoted a scheme which they were aware would provide a supply of water largely in excess of the requirements. They would be able to impound a daily supply of about 3¼ million gallons. The compensation water was 1½ million gallons—leaving a daily supply of 3¼ millions for their district, which was sufficient for more than double the population. But the Corporation were influenced by the fact that in the south-eastern portion of Northumberland there was a great deficiency of water, and that they might reasonably expect that a considerable quantity would be required for the purpose of the district. The Corporation proposed to take into their limits of supply the four places with which agreements had been made, including Tynemouth rural district, Cramlington, and part of the urban district of Morpeth. The intention of the Corporation was that where any local authority within their area desired to supply a borough, that supply should be given to the local authority, and that the local authority should themselves undertake the distribution of the water. This was the arrangement that the local authorities desired as a rule; and provision had accordingly been inserted in the Bill enabling agreements to be made with local authorities in the extended area for supplying them in bulk, and the Corporation of Tynemouth did nothing further in the matter. They gave a supply in bulk; and the only other power which, under the Bill, the Corporation of Tynemouth had, was that afforded by the Water-Works Clauses Acts to give a supply in the districts beyond. It was proposed to keep the agreements as if they were made under the Bill; and under the agreements the Borough of Tynemouth had the first drink, as it were, and the other local authorities afterwards. At the present time the supply was not satisfactory, and in many places inadequate. In some places, they had a supply from the Newcastle and Gateshead Water Company; but this was what was known as a day-to-day supply, and might be cut off without notice. Ashington was in an unfortunate position with regard to their water supply, because it was deficient in quantity and not good in quality. Up to Dec. 31 last, the urban district there was supplied by the Ashington Colliery Company. There were two services of water—one for drinking and domestic purposes, and another for watering the roads, &c., which there was no doubt was impure. In most of the houses, the water was not laid on. Stand-pipes were put at the end of the streets for the purpose of supplying 20 or 25 houses; and owing to the shortage, the water was constantly cut off. Sometimes the people had to wait at the stand-pipes for an hour or two. It was not surprising, therefore, that they went to the impure supply. During an outbreak of typhoid fever three or four years ago, the Government Inspector who investigated the matter reported that he was strongly of opinion that the outbreak originated in the water supply. Ashington was now opposing the Bill. Last December they leased from the Ashington Colliery Company the supply of water from the colliery, in view of the fact that the present Bill was pending, which was a very improvident proceeding.

Alderman *J. S. Spencer*, of Tynemouth, was the first witness called. He said the Corporation expected the reservoir which was nearing completion to be filled by January next. It was not the intention of the Corporation to deprive local authorities of any of their present sources of supply. He was in favour of the formation in the district of a Joint Water Board.

Tuesday, April 30.

In reply to the CHAIRMAN, Mr. Coward stated that Newbiggin, which was in the proposed area, had assented to go into their limits of supply. The only point at issue between the promoters and Cramlington was the question of pressure. With this exception, they also had agreed to go in.

Alderman *Spencer* (continuing his evidence), in reply to Mr. LANKESTER, said that Bedlington was now supplying itself with water from the Blyth. At present, if the sources of supply were to fail, and another Company came into the neighbourhood, there would be nothing to prevent them from bargaining with the Company for good terms. Under the proposed scheme, Bedlington would be entitled to share equally with Tynemouth in whatever water there might be. As matters at present stood, there was plenty of water for the next 30 or 40 years.

In answer to Mr. VESEY KNOX, witness said that the Ashington Coal Company owned the greater number of houses in the Ashington urban district, and had for twenty years furnished a water supply. The Urban District Council had now taken over the distributing mains, and had entered into an agreement to purchase the whole of their water in bulk from the Coal Company for a period of 25 years. He did not think it was the intention of the promoters under the Bill to compete with a council who were supplying water in detail. The amount of their water debt was between £300,000 and £400,000. The expenditure on the works under the Act of 1898 was about £399,000, in addition to which there was the expenditure under the Act of 1897, in round figures, of £100,000, which they had paid for the purchase of the old Water Company's undertaking.

Mr. *H. O. Soutter* (Messrs. Durnford and Co., Parliamentary Agents) gave evidence with regard to the drafting of the Bill.

In cross-examination by Mr. DILL, on behalf of the Morpeth Corporation, witness said that, under clause 2, the price to be charged for the supply of water was 6d. per 1000 gallons. The latter clause of sub-section 1. of clause 6 provided that: "The price to be paid for all water supplied by the Corporation under this section shall be at a rate to be

fixed by the Corporation of not exceeding 6d. per 1000 gallons, and an annual sum which shall be sufficient to cover the interest upon the moneys expended upon the works constructed under this Act by which the water is to be supplied from the Font gravitation main and upon all additional works which may from time to time be required to be constructed by the Corporation for the purpose of such supply."

Mr. *E. L. Mansergh* said he was quite satisfied that there was an ample surplus of water; and when the Fort reservoir was completed, it would be capable of yielding an average quantity of 4,750,000 gallons of water a day. Compensation water amounted to 1,500,000 gallons; leaving 3,250,000 gallons a day available for supply at once. The present demand in the borough was for 1,300,000 gallons per day; and the first main would carry 2,500,000 gallons a day—the surplus at once available being 1,200,000 gallons. By the laying of the second main, they would have an additional supply of 750,000 gallons per day. With regard to all the districts with whom they had agreements, with the exception of Morpeth Corporation and the Bedlington Urban District Council, he had assumed that they might have to supply 20 gallons per head per day, which was the same quantity as was supplied in the borough. The average supply per head for purely domestic purposes was 25 gallons; but it had gone up as high as 30 gallons. It was probable that they would not have need to develop the Font scheme for 20 years yet; and it would not be necessary to bring any further water for 28 years or more. Dealing with the northern works, he said that for the supply of Ashington, Morpeth Rural, Newbiggin, and North Seaton, the intention was to make a connection with the existing gravitation main at a point where the hydraulic gradient line was somewhere about 430 feet above Ordnance datum; to lay a line of pipes to a small tank at Pigdon, whose top level would be 420 feet above Ordnance datum; and from there to lay a main in an easterly direction for about 4 miles to the Pegswood reservoir. From there another main would be laid in an easterly direction through Ashington to Hirst, where there would be an elevated tank holding a small quantity of water the top level of which would be 120 feet above Ordnance datum. As far as the western boundary of Ashington, the main would be a large one, to supply the district of Ashington when they required water. Beyond this boundary the pipe would be a smaller one, and would only need to supply water to Newbiggin and North Seaton, possibly. From the Hirst tank, a pipe would be laid into Newbiggin, and any other mains that might be necessary. From the southern works, which were intended for the supply of Cramlington and the rural district of Tynemouth, a connection would be made to the main half-a-mile to the north-east of Hartford Bridge. This main would be laid along public roads entirely to a place called Northmoor, where the pipes would turn to the west and run across country to an intended reservoir at Down Hill. This would have a top level of about 310 and a capacity of 1,500,000 gallons. From this reservoir a main would be laid in an easterly direction back into the district. They had had geological difficulties in the construction of the Font reservoir; and this was why they wanted further capital powers.

The CHAIRMAN: What is the additional capital?

Mr. COWARD: £100,000.

In cross-examination by Mr. BALFOUR BROWNE, witness said that Bedlington had power to supply water. They also had an agreement with the Tynemouth Corporation to be supplied with water at any time, and in any quantity, for 4d. per 1000 gallons. If they were brought into the proposed area, he did not know there would be any special advantage to Bedlington; but they would not be harmed.

Mr. *James Jardine*, the Clerk to the Newbiggin Urban District Council, said that at the present time Newbiggin was supplied with water by means of three shallow wells, all of which were more or less liable to pollution. One of them was a fair supply; but the other was practically valueless; while one was almost dry.

Evidence was also given by Mr. *John Craigs*, a house agent, of Ashington, who said that the Coal Company had been supplying the district with water for a number of years past, and the supply had been taken over by the Council. The water was laid to stand-pipes in the streets; and in some cases as many as 40 houses were supplied by one tap. On some occasions, the water had been unfit to drink.

Wednesday, May 1.

Mr. *Craigs* was further examined to-day. In reply to Mr. VESEY KNOX, he said that the Ashington water was often of a yellow colour. When it was allowed to stand in a vessel, there was a sediment at the bottom.

Re-examined by Mr. FITZGERALD, witness said there was a shortage of supply. If additional taps were added, the shortage would be increased. The shortage had extended for six days at a time.

Mr. *Walter Wilson*, an employee of the Coal Company at Ashington, stated that he constantly heard complaints about the supply of water. He took a sample of water from the taps, and it was in a dirty state. In certain cases, it was quite a common thing for the water to be cut off; and when alterations were being made in the pipes, the water was very dirty and impure. In June of last year, the residents put their views before the Council, but without result. In one case there were three taps provided, from which 40 houses drew their water.

Mr. *George Campbell*, employed by the Coal Company, said that he could not imagine worse water than they had at the present time.

Mr. *W. Hogg*, the Postmaster of Pegswood, said the water supplied was very hard, and the pressure intermittent. Stand-pipes were used for the distribution of the water, which, as in many other districts, was supplied by the Colliery Company.

Professor *Redmayne*, a Director of Collieries, said he knew the Ashington supply, and the circumstances under which it was collected and distributed. It was not a proper supply, and it was not certain as to quantity or quality—in fact, no colliery water was a proper supply for drinking purposes. There was also the possibility that the operations in mines might take the water away. From a mineral point of view, the water was subject to fluctuation between the widest limits of supply. With regard to organic contaminations, he said the water might be perfectly pure to-day, but in six months' time it might be impure. Colliery water might be organically polluted from the surface of the ground or from the interior of the mine, whether the workings were old or new. This applied in the mines over the whole of the Morpeth urban district. He regarded the Ashington water as very hard.

Dr. *Dunn*, Public Analyst, said he had examined the proposed supply on several occasions, and had found it a suitable one. He had also examined two samples of the water sent to him, the origin of which he did not know, and had found them very hard. There was a considerable quantity of sodium sulphate present, which rendered the water unsuitable for drinking. Colliery water was very undesirable for drinking purposes. The amount of ammonia and nitrate in the water was indicative of organic pollution.

Mr. *Smillie*, the Engineer to the Tynemouth Corporation, said the Corporation were prepared to supply water to Ashington at 7d. per 1000 gallons, which would include the cost of laying the mains. The Ashington Urban District Council would be involved in an estimated expenditure of £3000 for the laying of the pipes, and an efficient supply would be afforded.

In cross-examination, witness said that Ashington could be supplied with water at 7d. per 1000 gallons. He was not able to say whether the Colliery, in supplying their own employees, would reduce the rateable value of the district from £32,000 to £15,000 in respect of water-charges.

Mr. *Benjamin Hewitt*, the Mayor, said it was calculated at the outset that the complete scheme would cost £30,000.

Mr. COWARD intimated that this completed the evidence on the water portion of the Bill; but there was some evidence to be given on the repayment of interest on borrowed money.

Mr. *Thomas Kershaw*, the Borough Treasurer of Tynemouth, said that, under the Act of 1898, repayment was suspended for ten years; but the Corporation found great difficulties in obtaining possession from the old Water Companies.

The CHAIRMAN: Is 15 years the shortest time?

Witness: We would like a longer period if it were possible.

Mr. BOYCE, for the Local Government Board, proceeded to deal with various points in the Bill upon which the Committee had asked for his assistance.

Thursday, May 2.

The case for the promoters having been concluded,

Mr. TALBOT to-day presented the case of the Tynemouth Rural District Council. He argued that no shadow of a case had been made in favour of including this body in the proposed area. On April 22, 1904, an agreement was made with the Tynemouth Corporation which dealt absolutely with the whole question of the water supply as between them and the Corporation. The agreement provided for the water supply of the district; settling the price to be paid for the water, the mode of supply, and placed them on an absolute equality with the inhabitants of Tynemouth itself. It obliged the Corporation, if there was not enough water, to give up as much as the Corporation themselves were receiving; and they were, if necessary, to go to Parliament for powers to supply them efficiently with water. What the Rural District Council asked was that they should be allowed to remain under the agreement.

The CHAIRMAN: If we put you within their limits of supply, do you desire this agreement to go in?

Mr. TALBOT: Yes.

In conclusion, Counsel appealed to the Committee that they should not be placed within the limits of supply as proposed by the Bill, but that the existing agreement should be confirmed and scheduled.

Mr. SHORTT then dealt with the case for the Morpeth Rural District Council.

Mr. *Hudson*, a member of the Council, said they had considered the Bill. They pointed out that the water in their district was both sufficient in quantity and good in quality. They had had no complaints; and it would be contrary to the interests of the Council if they were included in the proposed limits of supply.

Mr. *Andrew Adams*, the Sanitary Surveyor to the Council, said the parish proposed to take in 28 parishes in the district. The area of the district was 37,897 acres, and the population 9779. The price paid by them to the Colliery Company for the present supply was 9d. per 1000 gallons.

Mr. *Charles Hawksley* said that the water supplies in the Morpeth Rural District were ample in quantity and of good quality. One could never say how long an underground supply would continue; but it would be detrimental to the rural district if they were taken into the proposed area of supply. Being one of the witnesses on behalf of Ashington, he contended that, with regard to the supply of water at Ashington, the water was obtained from three sources underground. Some of the waters were liable to pollution; but they were kept entirely separate from the drinking supply—the water being distributed by different pipes, to which the public had not access. This water was used for such purposes as watering the streets. The drinking water was hard; but he disagreed with Professor Redmayne when he said that the hardness made it unsuitable for use.

Replying to Mr. VESEY KNOX, witness said he could not recall any case in which Parliament had given power in a district like this against the wishes both of the urban authority and the people supplying the water in bulk to any other authority. He considered it would be a hardship to the Company if this were done. They would have the works left on their hands, and the ratepayers would have a heavy burden. With regard to the supply of water at North Seaton on the Milburn Estate, it was of good quality and ample in amount, and was also free from liability to contamination.

Mr. SHORTT then addressed the Committee on behalf of the Rural District Council. At the outset, he strongly resented a suggestion made by Mr. Coward, that the opposition of the Council was purely one in order to obtain terms. The Council had considered the Bill; and they opposed it entirely and absolutely. In the evidence that had been given before the Committee, there had been no suggestion made against the water supply. The present Bill, so far as his Council were concerned, gave the promoters no more power than they had under their 1898 Act. They were able to give the Council every single facility to-day which the Bill, if it became enacted, would enable them to do.

There was the drawback, however, that, under the 1898 Act, the Corporation would be bound not to supply, if it was going to prejudice the supply to Tynemouth itself.

The CHAIRMAN (to Mr. Coward): Are you prepared to make an offer of 7d. per 1000 gallons to all the authorities. It would be a far more satisfactory way of dealing with the matter if we passed the Bill?

Mr. COWARD: We will consider it.

Mr. VESEY KNOX then went on to address the Committee on behalf of the Ashington Coal Company. He contended that, in a place such as Ashington, permanent heavy burdens ought not to be placed upon the people. So far, the supply had been as good as could reasonably be expected. Any defective distribution that there might have been in the past could easily be rectified without the passing of the Bill—in fact, there was no public need for the change. If the Bill were passed, they would be injured, inasmuch as the Tynemouth Corporation would then have the power to compete with the Urban District Council, and thereby the amount of water sold by the latter would be diminished. If the promoters agreed with the Chairman's suggestion to make 7d. per 1000 gallons an inclusive charge, then the burden upon their ratepayers would certainly be diminished.

Mr. HONORATUS LLOYD, on behalf of the Ashington Urban District Council, said that the supply taken from the collieries was from disused seams, and was most carefully got so as to prevent pollution. It was a monstrous proposition on the part of the promoters to say they would go into his district and supply water. Such a thing had never been done. He heard the promoters say there were precedents for such a thing; but he denied that there were. The promoters could not show a single precedent where a local authority had been allowed to go into another local authority's area to supply water.

Mr. *Southern*, the Agent of the Ashington Coal Company, then gave evidence. He said that, on the basis of the consumption of water at the present time, it would cost them £10,791 18s. 9d. to obtain a similar supply for Tynemouth. The water-rate worked out at 2s. 8·36d. From Jan. 1 to March 30, the quantity of water supplied amounted to over 8 million gallons.

Friday, May 3.

The CHAIRMAN, on the resumption of the proceedings to-day, asked what the promoters had to say with reference to the supply of water at 7d. per 1000 gallons.

Mr. FITZGERALD replied that they had considered the matter; and they were perfectly prepared to put into the Bill an inclusive maximum charge of 8d. The price then would not, in any case, exceed 8d. per 1000 gallons, whatever works might be necessary to give the supply to the boundary of the district. In that case, the whole supply must be taken, because it would be entirely inequitable to call upon the Tynemouth Corporation to execute works that might cost £20,000 or more for the purpose of bringing the supply to the district boundary, and for them to then take a nominal quantity.

The CHAIRMAN: Do I understand you made an offer of 7d. to one district, or more?

Mr. FITZGERALD: There was an offer made to Ashington, without prejudice, at an inclusive price of 7d. But what you are asking me to do is to give an inclusive price for the whole district; so that I have to take a maximum figure that would cover the expenditure, wherever I supply. I might have to supply at places some distance from the line of pipes.

The CHAIRMAN: Would you prefer to differentiate between the different districts?

Mr. FITZGERALD: The maximum of 8d. I am doing as an alternative—giving the local authorities an alternative to get a maximum supply at an inclusive charge. It is not to over-ride any of the existing agreements, nor is it to over-ride the provision in clause 6 of the Bill—that they may have a supply at the rate of 6d. per 1000 gallons, *plus* the sum to cover the necessary expenditure. I am making a further offer than what is stated in the Bill, but not preventing them getting any advantage from the provisions of the Bill as it now stands.

The CHAIRMAN: In the event of a district not taking your water in bulk, you then claim the right to supply the district in detail—distribute the water. Is there anything in the Bill to give any *locus* to a district authority?

Mr. FITZGERALD: No. If a local authority did not take the supply in bulk, we become the distributing authority; and if we laid a main through their district, then, under the Water-Works Clauses Act, we should be compelled to give a supply to any person who asked for it. We should have no option.

The CHAIRMAN: In the event of the passing of the Bill some *locus* should be given so as to enable the local authority to come to an agreement with a person who demands water?

Mr. FITZGERALD: I do not think the question of *locus* creates many difficulties. Any individual who wants water knows he can get it from the local authority; and he can go to them. If he comes to us, it is a voluntary act.

Lord VERULAM: In the event of the agreement standing, and the rural authority did not go to the Corporation for their water, do I understand that the Corporation could not go behind them and compete with them in detail in their district?

Mr. FITZGERALD: If they do not take the supply.

Lord VERULAM: With regard to the Tynemouth Rural District Council, could the Corporation go behind them and compete with them in their district, provided the agreement stood and the District Council did not take water in bulk?

Mr. FITZGERALD: The agreement which now exists becomes an agreement under the terms of the Bill; and that agreement standing, we could not compete with them.

The CHAIRMAN: Where there is no agreement, you can compete?

Mr. FITZGERALD: Where there is no agreement now, or where no agreement is made under the Bill, then we could compete, because the district comes into our area of supply.

Mr. WILKINSON then addressed the Committee on behalf of the Milburn Estate. So far as they were concerned, the Bill sought to acquire a portion of their land and include the whole of the estate in the added area. If the Bill were passed, the estate would be included in the area, and the Corporation would be empowered to supply consumers whom they (the Milburn Estate) were now supplying.

Mr. CLEASE proceeded to call evidence on behalf of the Ashington Urban District Council.

Mr. *Wood*, the Surveyor to the Council, said he had never heard a single complaint of dirty water having been obtained from the taps.

Mr. *William Wilson*, a member of the Council, said he was a tenant of the Duke of Portland. He had no reason to complain in the least as to the quality of the water. There had been negotiations between the Tynemouth Corporation. The Mayor of the Corporation had told them that the estimated cost of the main was £30,000, and there would be something like £500 a year payable for the maintenance of works and pipes. The charge to be made would be based upon the population; while they might charge as much as 10 per cent. upon the cost of the works.

Mr. HONORATUS LLOYD, having called evidence with reference to the petition of the Duke of Portland, then addressed the Committee. He said the Duke owned over 10,000 acres of land on the Pegswood area. The promoters had rushed into a scheme and saddled themselves with a municipal debt. They had got water on their backs which they wanted to pour off on to somebody at some price. The debt round their neck they wanted to share with someone; but the petitioners did not want to go into a rotten concern.

Mr. BALFOUR BROWNE spoke for the Bedlington Urban District Council and the Northumberland County Council, and Mr. DILL for the Corporation of Morpeth.

Mr. *Nicholson*, Clerk to the Cramlington District Council, said that that body had always resisted their inclusion in the proposed area.

Mr. MOON then proceeded to address the Committee on behalf of the Cramlington Urban District Council. He said that in 1904 the Council agreed to take their water in bulk from the Tynemouth Corporation. The reason was that at that time they were opposed to going into the limits of supply of the Newcastle and Gateshead Water Company. That agreement, however, in no way included them in the Corporation area.

Monday, May 6.

Mr. FITZGERALD replied to-day on behalf of the promoters. He pointed out that the whole of the opposition was practically directed against two clauses in the Bill—clause 4, relating to the extension of the limits of supply, and clause 6, relating to the supply in bulk to the local authorities. There was no opposition whatever in regard to the additional moneys that were required to complete the Fort reservoir, nor with regard to the works proposed in the Bill. It had become the ordinary practice of Parliament in Bills of this nature to empower the local authority to take easements. He had to satisfy the Committee that a supply of water was necessary in the extended limits of supply. Five of the districts in question had made agreements to take water from the Tynemouth Corporation; and the only districts that had not agreed to do so were the Ashington Urban District Council and the Morpeth Rural Council. The latter gave a supply the source of which was in the collieries. In Ashington, there was no supply in the majority of the houses. The supply in the stand-pipes frequently failed; while at other times there was no water at all. A colliery water supply was always unsatisfactory, because it could not be maintained continuously, owing to the shifting of the strata. It was always liable to pollution, and was hard and unsuitable for domestic purposes. If the Committee passed the present Bill, these authorities could get as much water as they liked, of good quality, and at a moderate price. It was the commonest thing throughout the country, and especially in the North of England, for a large town to obtain water from a distance, and to supply not only the town itself but a large region outside. These smaller districts could not supply themselves. Large towns, however, could raise the necessary money for the purpose, and, by taking the smaller districts into their area, could give them a sufficient supply. The advantage was mutual. It had been suggested there was something novel in the provisions of the Bill. As a matter of fact there was nothing novel, inasmuch as the provisions in other Bills were the same or similar. There was no compulsion upon the local authorities to take the water.

After a short adjournment,

The CHAIRMAN announced that the Committee had carefully considered the Bill and all the arguments that had been adduced, and on the whole they had come to the conclusion that it was not expedient to proceed further with it.

Mr. FITZGERALD remarked that there was a great deal of the Bill that was not opposed.

The CHAIRMAN replied that any portion that was not opposed might proceed; but they did not include the limits of supply as stated in clause 4. The Committee's decision meant that clauses 4 and 6 (which were those relating to the extension of the limits and the power to supply in bulk) went out of the Bill.

The Committee then spent a short time in adjusting clauses and in inserting protective clauses.

Tuesday, May 7.

The Committee made certain further adjustments this morning which had been left over for consideration, and then ordered the Bill, as amended, to be reported to the House.

Accrington Gas and Water Board.—The Accrington Gas and Water Board have been considering tenders for the supply of 50,000 tons of gas coal during the next twelve months; and it is stated that the quotations are from 2s. to 2s. 6d. per ton more than for the two preceding years. The increased expenditure which will thus be incurred is practically equivalent to a 4d. rate on the whole of the district; and it is thought that it might be difficult for the Board to get through the year's working without a material increase in the price of gas. While coal is so much higher, the tenders for residuals, in the shape of tar and ammoniacal liquor, show a slight decrease on the prices hitherto obtained.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Saturday, May 4.

(*Before the* MASTER OF THE ROLLS, *the* PRESIDENT OF THE PROBATE DIVISION, *and Lord Justice* KENNEDY.)

Corporation of Carlisle v. Earl of Carlisle.

This was an appeal from the decision of the Divisional Court, referring an award in connection with the Geltsdale arbitration back to the Umpire to state it in the form of a special case.*

The Hon. J. D. FITZGERALD, K.C., Mr. ACLAND, K.C., and Mr. DU CANE appeared for the appellant; Mr. BALFOUR BROWNE, K.C., Mr. PAGE, K.C., and Mr. J. G. WOOD represented the respondents, the Corporation of Carlisle.

Mr. FITZGERALD, in opening the appeal, said that the order of the Divisional Court was made on the ground of legal misconduct on the part of the Umpire in not stating his award in the form of a special case. But he should submit, first, that there was no question of law involved, but a pure question of fact; secondly, that there was no misconduct of any kind on the part of the Umpire; and, lastly, that the Court below had no jurisdiction to order the Umpire to state his award in the form specified. Counsel produced a map of the ground, and stated the nature of the works and the powers conferred on the Corporation by their Act of 1898. He then went on to argue at great length (as he had done in the Divisional Court) that the compensation awarded was actually for the depreciation in the value of the claimant's property, and that, though his witnesses had mentioned in their calculations ¼d. per 1000 gallons, this was only an arbitrary measure of the depreciation; and he had expressly repudiated the idea that Lord Carlisle was selling the water, or that the Corporation were purchasing it from him. His position was that such an estate as the one in question, situated at a considerable elevation, with a very large gathering-ground absolutely free from pollution, had in these days, when large towns had to go a long way to procure pure water supplies, a very high value on account of its water-bearing qualities, quite apart from its worth as an agricultural or sporting estate; but that when a city like Carlisle obtained parliamentary authority to draw water from such an estate, this special value was destroyed or very greatly depreciated, because no other town could hope to obtain powers over the same site. For this depreciation he maintained that the appellant was entitled to be compensated; and, further, that it was a question of fact and not of law. The expression "sale of water," which occurred more than once in the course of the proceedings in the arbitration, was, no doubt, inaccurate; and he repudiated having put the claim on any such basis. The words were only used as a measure of the value, and consequently of the depreciation. Counsel then went on to read extracts from the proceedings in support of this contention, and concluded by submitting that, in the circumstances, the Divisional Court had no power to remit the award.

Mr. ACLAND said he did not propose to enlarge on the main argument of his leader, but merely desired to refer to several authorities to show that after an award had been made, there was no power to remit it, except in a case where there had been some misconduct on the part of the arbitrator, where there was an admitted mistake, where the award was bad on the face of it, or where additional evidence had been discovered. He submitted that not one of these things was present here. The matter had been put throughout on the ground of legal misconduct on the part of the Umpire in not stating a special case when requested. His (Counsel's) submission, however, was that no definite request to this effect had been made, but only one that a case should be stated if the Umpire were against Mr. Balfour Browne's contention on one point; and there was nothing whatever to show that he was against him. He cited several authorities in support of this contention.

Saturday, May 11.

On the resumption of the hearing this morning,

Mr. BALFOUR BROWNE opened the case for the respondents. He dealt first with the argument of Mr. Acland that there was no jurisdiction to remit the award. He submitted that if the Umpire had valued property which did not belong to Lord Carlisle—viz., water—this was such a mistake in law that it ought to go back. Further, that there had been such legal misconduct on the part of the Umpire, in not stating a case, or at any rate in plainly declining to do so (in which case the respondents could have come to Court and obtained an order before an award was made), as entitled the Court to remit the award. Coming to the real question in dispute, he quoted various passages from the arguments and evidence in the arbitration, to show that the appellants' case had been throughout based on a sale of water, though, as Mr. Justice Darling had put it in his judgment, his friend said, in effect: "I know that would be wrong, and would invalidate the award; so I ask you to give that amount. But do not say it is for the sale of water; say it is compensation." The witnesses put it distinctly as a sale of water; and Mr. Fitzgerald's argument was practically to the same effect. Counsel then went on to show from the evidence that, after the fullest compensation for all other items, the award must have included at least £8000 for the water, which Lord Carlisle could not sell, and therefore had no right to be paid for. His submission was that no compensation whatever could legally be given for water; it was not a question of amount, but of principle. If he could have shown that the Umpire had awarded something for land which did not belong to Lord Carlisle, it was plain that the award must have gone back; and in the same way it ought to go back when it was plain that he had valued water which equally did not belong to his Lordship.

Mr. FITZGERALD, in reply, repeated the arguments he had put forward in opening, and said it was an instance, of which there had been several before the Courts, of "special adaptability," for which the owner of the estate was entitled to be compensated.

Lord Justice KENNEDY said unfortunately that was not the way in which the case was put forward.

Mr. FITZGERALD said he put the case in a broad way, and said in this instance the estate had a value beyond that of a purely agricultural or sporting character. He used the value of the water taken as a measure of the depreciation of the whole estate, including the loss of value of a certain portion which was suitable for a reservoir. In conclusion, he submitted that this was a question of fact, on which the Umpire had decided, and that there was no jurisdiction to send his award back.

The MASTER OF THE ROLLS, in giving judgment, said he had come to the conclusion that the decision of the Divisional Court was substantially right, though on one point he thought it should be modified. The arbitration arose out of the taking by the Corporation of Carlisle of certain properties belonging to, and easements over the estate of, the Earl of Carlisle. The Corporation obtained power to abstract water from a certain stream or streams which were partly fed from springs on Lord Carlisle's estate, and also to take the water direct from the springs. The claim made before the Arbitrators and the Umpire was divided, as was reasonable and natural, into several distinct heads. In the opening of the case by Mr. Fitzgerald, after mentioning the special appropriateness or adaptability of portions of the estate for the purpose of water-works, he said: "Assuming the figures supplied by the Corporation are correct, the way we propose to put the valuation before you is that inasmuch as this spring water is sufficient for the supply of Carlisle at the present moment, and for a good many years to come, one year with another, we shall ask in respect of that, ¼d. per 1000 gallons, which will work out, on the figures that have been supplied to us, at about £22,000." This claim was to some extent qualified and modified by the subsequent observations of Mr. Fitzgerald. But, reading it as an ordinary layman would, it did seem to him to be a claim for the sale, at the rate of ¼d. per 1000 gallons of water, amounting in the total to about £22,000. Evidence was given by two experts—one, a Mr. Wainwright, who exhibited, in justification of his figures, that which it was not inaccurate to describe as the claim of Lord Carlisle. There was a detailed valuation of land, damages, and easements, including springs. After valuing the lands taken and the right to lay down the pipes and the easements, he proceeded to estimate the damage to the land not taken for the intended works—depreciation, for instance, of the remainder of the farm—and then at the end came an item which was far more important than all the rest put together. It was: "Spring water Lower Tarmoneth, Sheep-wash, Old Bridge, and Leach's, say, 85 million gallons per annum, at ¼d. per 1000 gallons, £885; which, taken at 25 years' purchase, brought out a sum of £22,135." That this witness meant what anybody would necessarily gather from such a valuation was quite plain, because in his cross-examination he said—not once, but twice—that it was just the same as though the Corporation of Carlisle were taking the coal from under Lord Carlisle's estate. This having been the evidence given by their first, and in some respects their principal, expert witness, Mr. Clark, the second expert witness, so far from modifying the view already expressed, put in a valuation in which he arrived at his figures with great clearness under different heads, including "water taken." He calculated the number of gallons per annum at ¼d. per 1000 gallons, and worked it out at £22,888. In the course of the arbitration proceedings, Mr. Balfour Browne, who appeared for the Corporation, objected to this mode of claiming on the part of Lord Carlisle. He more than once asked for a special case to be stated; and there was evidence to show that it was believed, not only by Counsel but by the parties concerned, that this request, which did not seem an unreasonable one, would be complied with. Instead of this, the award was made for a sum about £7000 or £8000 more than was claimed by Lord Carlisle in respect of all the items other than what was called in one valuation "spring water," and in the other "water taken." So that it was quite clear that even if the Arbitrators or the Umpire adopted every figure given by Lord Carlisle's witnesses in respect of the other items, a very large sum indeed must have been allowed in regard to this "spring water" or "water taken." Under these circumstances, the view of the Divisional Court was that there had been what had been described as "legal misconduct" on the part of the Umpire, whereby the parties were prevented from applying to the Court, as they might have done before the award was made, that he should state a special case; and, further, that this "legal misconduct" was sufficient to enable the Court to remit the award to the Umpire. His Lordship entirely assented to this view; and he was disposed to think that it appeared sufficiently on the face of the award that it covered a claim for that which Lord Carlisle unquestionably had not to sell—namely, the water from the springs. It had been forcibly urged by Mr. Fitzgerald that, though Lord Carlisle was not entitled, as he frankly admitted, to sell the water as water, he was entitled to compensation—and it might be to large compensation—by reason of the fact that the works of the Corporation, by taking only small portions of the estate, involved the destruction of what had been called a reservoir site or sites which had a special value from their adaptability, and therefore in respect of which compensation ought to be claimed because they could not now be used for such a purpose. This was an important point, on which it was quite possible and probable that a great deal might be said on behalf of Lord Carlisle; but there was no evidence bearing upon it. The claims put forward by the expert witnesses did not hint at, still less did they condescend to give, any figure based upon that claim for compensation to which Mr. Fitzgerald, in his reply, ultimately limited his case. Under these circumstances, an award based, as it demonstrably was, to a considerable extent, upon the supposition that Lord Carlisle was selling, and the Corporation were paying for, water which he had no right to sell, could not be deemed satisfactory. He therefore thought it should be remitted to the Umpire; but he ought not to be bound to make his award in the form of a special case. It would be much more satisfactory that the matter should be remitted to the Arbitrators and the Umpire, leaving them to take such further evidence as the parties might desire, feeling sure (although it was not necessary to make it part of the order) that they would give the parties every opportunity, before the award was made, of raising, in the form of a special case,

* See "JOURNAL," Vol. XCVII., p. 831.

any point of law such as that which had now been raised. The order of the Divisional Court would therefore be affirmed, with the variation he had mentioned, and the appeal dismissed.

The PRESIDENT OF THE PROBATE DIVISION gave judgment to a similar effect. In the course of it he said he could not satisfy himself that the Umpire had not included what he ought not to have included; and this being so, it would be unsatisfactory to leave the case where it stood.

Lord Justice KENNEDY also expressed his concurrence with the judgment of the Master of the Rolls.

A discussion ensued as to the costs; and it was decided that the Corporation should get the costs of the appeal; those in the Court below to be dealt with by the Arbitrators and Umpire, who would be at liberty to make the award in the form of a special case, and also to hear further evidence, if necessary.

Distraint upon a Gas-Engine.

In the Shoreditch County Court, on Monday last week, the hearing was concluded, before his Honour Judge Smyly, K.C., of an action brought by Messrs. Crossley Bros., Ltd., against Mr. H. W. Lee, of 449, Hackney Road, to recover an "Otto" gas-engine or its value, or damages for alleged wrongful distress upon the engine, which had been sold. Mr. Schwabe appeared for the plaintiffs; Mr. Abinger represented the defendant. In opening the case, Mr. Schwabe said that the engine was let on hire to a man named Jones, a tenant of the defendant. Jones subsequently sublet his portion of the premises to a man named Fuller, and then apparently disappeared. The rent having fallen into arrear, the defendant put in a distress on the whole of the premises; and as there was nothing else to satisfy him, he distrained upon the gas-engine. Fuller protested against this, as he said he had purchased the engine; but it was eventually sold by public auction. The plaintiffs claimed that the defendant had no right to distrain on a fixture, such as the engine was. Mr. Schwabe then proceeded to call a number of witnesses, including the plaintiffs' workmen who assisted in fixing the engine, and who all agreed that the method adopted was the same as that employed in the putting down of all their engines—viz., firmly placed on a bed of concrete. Fuller said he purchased the engine from Jones for £50, though he had no receipt to show for it. In cross-examination, he said that when the distraint was made, he attempted to get the engine out piecemeal. The bailiff, however, stopped the job, and witness then found that some parts of the engine had been stolen. Evidence called for the defence showed that even if the engine had been put down as a fixture it was not so when the distraint was made, as an iron bed had previously been inserted between the engine and the concrete. On the point of law, Mr. Abinger submitted that the ruling of the Courts above had never been altered, to the effect that in the case of mortgagor and mortgagee the landlord's right to distrain was upset; but in ordinary landlord and tenant law, such as applied in the present case, there was no overriding the landlord's authority. Mr. Schwabe said his contention was that the engine was a fixture in the meaning of the law. Judge Smyly said he could not go against the Courts above. He found that the landlord did distrain, if it was found by the Courts above that the engine could be distrained upon. In the event of his decision being reversed, he found the value of the engine to be £22. He entered a verdict for the defendant, and said the plaintiffs would have no difficulty in moving the Divisional Court to find the damages if they desired to go on.

Monte Video Gas Company, Limited.

In the report to be presented at the ordinary general meeting of this Company on Thursday next, the Directors state that the profit on the working of the year ending Dec. 31 last was £24,974. Adding interest and discount (£1385), profit on exchange (£323), Directors' fees waived (£280), and the balance brought forward (£10,686), there is a total of £37,649. After providing for interest on the debenture stock, income-tax, bad and doubtful debts and depreciation, and reserving £1000 for renewals, &c., the balance available for distribution is £29 904. An interim dividend of 6s. per share, less income-tax, was paid last November; and the Board recommend the payment on the 1st prox. of a further dividend of 8s. per share, also less income-tax; making 3½ per cent. for the year. This will leave £10,937 to be carried forward. The balance at the credit of the reserve account is £23,760; the contingency account stands at £15,594; and the insurance fund remains at £12,500. A substantial increase in receipts was obtained during the year. This good result was, however, almost entirely neutralized by the higher cost of materials and wages. The sales of gas and the number of consumers continue to show satisfactory expansion; and the temporary diminution in the revenue which was caused by the large reduction in the price charged for gas has been entirely recouped. The Directors record that last August Mr. Charles Hunt, one of their number, proceeded to Monte Video, and made a careful and professional inspection of the Company's works and property; and they state that his report thereon is of a most satisfactory nature. They feel that the information thus obtained will be of great utility in the future working of the Company. The plant and property have been maintained in a state of efficiency.

Church Lighting at Bristol.—In the course of the proceedings at a meeting at the Redland Grove School-room, Bristol, last Tuesday, Mr. Thomas Butler, a member of the Corporation, remarked that those who believed in the electric light undertaking of the Town Council and the ratepayers generally would no doubt be interested to learn that in the church above which they had met (which seated more than 500 persons), the whole of the lighting was done by incandescent gas, and the cost worked out at 2½d. per hour, including the renewal of mantles. He invited the gathering at the close of the meeting to see the chapel lighted—an invitation accepted by the majority of those present. General admiration was expressed at the clear and bright illumination.

MISCELLANEOUS NEWS.

COMPENSATION FOR INDUSTRIAL DISEASES.

The report of the Departmental Committee on Industrial Diseases which was appointed towards the close of last summer has just been issued. The Committee consisted of Mr. Herbert Samuel, M.P., Parliamentary Under-Secretary for the Home Department (Chairman); Dr. T. Clifford Allbutt, F.R.S., Regius Professor of Physic in the University of Cambridge; Mr. H. Hardinge Cunynghame, C.B., the Legal Under-Secretary at the Home Office; and Dr. T. Morison Legge, the Medical Inspector of Factories—Mr. F. L. D. Elliott, of the Home Office, being the Secretary. The duty assigned to the Committee was to inquire as to what diseases and injuries, other than those caused by accidents, are due to industrial occupations, are distinguishable as such, and can properly be added to the diseases enumerated in the third schedule to the Workmen's Compensation Act, 1906. The Committee held 41 sittings, of which some were at Bradford, Huddersfield, Sheffield, Birmingham, Wolverhampton, Glasgow, Manchester, and Swansea; the rest being in London. They heard the evidence of 159 witnesses, 92 of whom belonged to the medical profession; the others being almost all either employers or workmen. They visited many factories and works of various kinds, in order to view the processes they were investigating; and the medical members of the Committee made clinical examinations of a number of the workpeople engaged in them. They had the advantage of consulting the evidence and the reports, in so far as they related to the subject-matter of their inquiry, of Committees previously appointed on Dangerous Trades, on the Conditions of Labour in Chemical Works, on the Dangers to the Life and Health of Workers in Quarries, on Water Gas and other Gases Containing a Large Proportion of Carbonic Oxide, and on the Health of Cornish Miners. They found much valuable information also in the annual reports of the Chief Inspector of Factories, in Dr. Oliver's encyclopædic book on "Dangerous Trades," and in a number of technical publications by medical men.

To each of the diseases or forms of injury which came under their consideration they applied three tests in compliance with the provisions and intention of the Workmen's Compensation Act: (1) Is it outside the category of accidents and diseases already covered by the Act? (2) Does it incapacitate from work for a period of more than one week, which is the minimum period for which compensation is payable under the Act? (3) Is it so specific to the employment that the causation of the disease or injury by the employment can be established in individual cases?

(1) The question of the proper line of demarcation between "accidents," which are already included in the Act, and "diseases" which might properly be added to its schedule, arose several times in the course of the inquiry. The Committee had to consider, for example, many forms of poisoning by gaseous fumes; and they could not all be left in the category of "accidents." In some cases, in which compensation was clearly payable, the symptoms occurred through the exposure of the workman to the noxious fumes during a considerable period; and though this exposure might sometimes be due to some definite mistake in the process of manufacture, in other cases no exceptional cause could be assigned with certainty. The Courts could not hold in such circumstances that the man's illness was due to an "accident;" and it would be necessary to schedule it as an industrial "disease." On the other hand, these accidents could not all be placed in the category of diseases. The Committee say that to class as "diseases," and not as "accidents," cases in which men are suddenly asphyxiated by some poisonous gas, evolved in a mine explosion, for example, or released by the bursting of a vessel, even if the consequences be deferred or protracted, would be to do violence to the ordinary use of language. There is the same difficulty regarding many kinds of muscular strains and internal lesions. It is necessary to find some dividing line.

(2) The second condition—that the disease or injury should be such as to incapacitate from work for a period of at least a week—is adopted by the Committee for obvious reasons, and presents little difficulty. It excludes a very few ailments, some transitory in their effects, but not such as to prevent workmen from continuing at their trade.

(3) The third condition requires the disease or injury to be specific to the employment. The Committee remark that many diseases may be regarded as trade diseases, and be rightly so regarded, because they are known to be specially prevalent among the workers in particular industries; but they may not be specific to the trade, since they may frequently, although more seldom, attack persons engaged in other occupations. The Committee gather from the debates in Parliament that it was a recognition of the necessity of some means of determining in individual cases whether or not the disease was due to the employment, which decided the Legislature not to open the door to claims from workmen suffering from any disease, as the door is open to claims on the score of any accident, but to proceed by way of scheduling those diseases which can, in any given case, be differentiated as due to the special conditions of a trade. This argument is subject to the qualification that where a disease is common in a particular trade, and the same disease exists, but very rarely, outside the trade, it may be right to make it the subject of compensation, even though the employers may be called upon to relieve the small percentage of cases which would occur among the men employed in the industry while due to causes unconnected with it.

The Workmen's Compensation Act permits the burden of proof, in the question whether a disease was or was not due to the employment, to be laid in any class of cases either on the workman who makes a claim or on the employer who resists it. Section 8 (1) provides that compensation shall be paid to a workman who is found to be suffering from a disease mentioned in the first column of the third schedule to the Act. Section 8 (2) provides that if the workman was employed in any process mentioned in the second column of the third schedule opposite to that disease, then, in ordinary course, the disease shall be deemed to be due to the nature of the employment unless the employer proves the contrary. In each of the cases investigated, the Committee therefore found it necessary to consider on which party it was just to

lay the burden of proof—in other words, what processes, if any, should be added to the second column of the schedule in connection with diseases to be added to the first.

With these introductory remarks, the Committee proceed to consider various kinds of disease, beginning with forms of poisoning. From these we select the following.

Nitro and Amido Derivatives of Benzene.—Dinitrobenzol and dinitrotoluol (nitro-derivatives of benzene) are recognized as capable of producing marked symptoms of ill-health among the comparatively small number of men engaged in their manufacture, or in their use in the preparation of certain high explosives. These symptoms may incapacitate for some weeks or months. Poisonous effects result from inhalation of fumes or dust, and, unlike most other chemicals, from direct absorption through the skin in handling the material itself or solutions containing it. The symptoms are due to degeneration and destruction of the red corpuscles in the blood, and to direct action, in severe cases, on the nerve centres. Anæmia and cyanosis (lividity), most easily seen in the lips, are always prominent and distinctive.

Inhalation of the vapour of anilin oil (an amido-derivative of benzene) or of the vapour of anilin hydrochloride, or absorption of the oil through the skin, may cause symptoms of the same nature, and due to the same cause, as those just described; though, as a rule, they are much less pronounced. Poisoning by dinitrobenzol and anilin is distinctly a trade disease; and we consider that those who are employed in their manufacture or in their use should be entitled to compensation when incapacitated by their effects. These forms of poisoning can be most conveniently scheduled under the general heading of "Poisoning by nitro and amido derivatives of benzene," a form which would also cover cases of disease from the use of other members of this dangerous chemical group, should such cases occur.

Carbon Bisulphide has been the cause of a number of grave cases of disease. The chronic effects were due either (*a*) to the action of the vapour, when inhaled, on the nerve centres, causing mental exaltation or depression, or (*b*) to inflammation of the sensory and motor nerve endings, producing numbness of the feet and hands, followed in some cases by peripheral neuritis or temporary blindness. In less severe cases headache, dizziness, gastric disturbance, and impairment of appetite were frequent. The dangerous properties of carbon bisulphide have long been recognized, and stringent special rules were made by the Home Secretary in 1897 to protect workers exposed to its effects. These rules have proved successful; and our inquiries lead to the conclusion that in recent years the disease has been wholly eradicated. The possibility of poisoning, however, remains; and should cases recur, we consider that they should be the subject of compensation.

Carbonic Oxide.—We received much evidence to the effect that poisoning by this gas is invariably sudden, and therefore in the nature of an accident, and that after-effects can be referred back to a definite time when inhalation occurred. But four instances were given by Dr. Judson Bury and Dr. Oliver of gradual poisoning, without occurrence at any time of unconsciousness, by furnace gas, in which about 25 per cent. of carbonic oxide was present. Multiple neuritis was the main symptom in all four cases; and there appears to be little doubt that some constituent of the furnace gas was the direct cause. The subject, however, is by no means free from obscurity. Had a gas, which is so common as carbonic oxide, possessed noxious qualities of this character, we should have expected that the fact would have been recognized long since and in many more than four cases. The evidence that has been so far collected we cannot consider sufficient to establish that poisoning either by carbonic oxide or by other gases evolved in furnaces can be regarded as a trade disease.

Nitrous Fumes.—Cases of poisoning from this source (some fatal) were described by witnesses as occurring at times in chemical and explosives factories. A characteristic of this form of poisoning is the insidious onset of the symptoms. A man may go on working with little inconvenience after inhalation of the fumes, and yet succumb 24 or 36 hours later from acute congestion of the lungs. The fumes set up severe inflammation, which takes some hours to bring about the exudation into the smaller bronchial tubes and air vesicles which eventually completely fills them. It was the opinion of witnesses that such poisoning was in the nature of an accident. Cases might arise, however, where proof of this was difficult; and, since compensation should be payable in such cases, we think it advisable to recommend the inclusion of "Poisoning by nitrous fumes" in the schedule.

Sulphuretted Hydrogen.—Sulphuretted hydrogen gas, evolved in various processes in gas and chemical works, has not unfrequently produced grave and even fatal illness; but its generally recognized effect is extreme suddenness of onset. The "gassing" takes place at a particular moment. We, however, had evidence from the Chief Inspector under the Alkali Acts of special susceptibility of some persons to the effects of sulphuretted hydrogen gas, so much so as to necessitate their seeking some other employment. We are of opinion that such cases are exceedingly rare. Nor can personal idiosyncrasy of this kind be said to be equivalent to incapacity due to the nature of the employment. We consider that no sufficient argument has been adduced to enable us to regard the effect of the gas, for the purposes of the Workmen's Compensation Act, as other than due to accident.

Sodium Cyanide and Other Cyanogen Compounds.—Hydrocyanic acid gas, generated in the manufacture of cyanide compounds, has caused fatal illness. But its effect is sudden also; and we have not received evidence that workmen suffer gradual poisoning as the result of exposure over a period of time. We communicated with the factory surgeon at a sodium cyanide plant in existence for some years, but no case of gradual poisoning among the workmen employed upon it had come under his notice, though any such case would have become known to him directly or indirectly. Cases of illness from these compounds are therefore "accidents" within the meaning of the Workmen's Compensation Act, and it is neither necessary nor possible to include this form of poisoning in the schedule.

Under the heading "Diseases of the Skin," the Committee made the following remarks: We find that men engaged in the handling of pitch or other tarry products, either in unloading pitch from vessels or railway trucks, in the manufacture of briquettes, or in handling "coal oil" in the manufacture of grease, are liable to suffer from warty growths, which ulcerate and occasionally become the seat of epitheliomatous cancer. . . . Epithelioma is the least malignant form of cancer, and on removal is not usually followed by a recurrence. We saw men, still at their ordinary work and in good health, on whom such operations had been performed several years previously. The amount of incapacity caused by the condition, whether in its benign or malignant manifestation, need not be great. There was general consensus of opinion that the cancerous condition could be prevented by scrupulous cleanliness; but we satisfied ourselves that occasionally it may develop in those who have paid all reasonable attention in this respect. Particles of pitch striking the eye are prone to set up very severe inflammation of the conjunctival mucous membrane and cornea. It was stated that where injury occurs to the eyes by pitch, "they generally do very badly." A breach of surface caused by the chemical action of the pitch particle gives entrance to bacteria which induce a septic inflammation involving the cornea and other structures of the eye, so the danger of loss of sight is considerable. The Committee saw a case of blindness which had resulted in this way. They have no doubt that the lesions are specific to the trades mentioned, and that they should be made the subject of compensation.

The Committee recommend a number of additions to the third schedule of the Workmen's Compensation Act, among them being the following: Poisoning by nitro and amido derivatives of benzene; poisoning by carbon bisulphide or its *sequelæ*, and epitheliomatous cancer or ulceration of the skin or of the corneal surface of the eye due to pitch, tar, or tarry compounds. Of diseases coming within the recommendation some are seldom seen by medical men, and occasionally difficulties of diagnosis may arise. The Committee consequently think it most desirable that the referees who will be appointed to adjudicate on medical points in disputed cases should be specialists, with particular knowledge and experience of the diseases indicated.

WELSBACH INCANDESCENT GAS-LIGHT COMPANY.

Annual Report.

In the report for the year to March 31, the Directors state that the net profit, including the dividend for 1905-6 upon the Company's holding in the Austrian Company, amounts to £83,961. To this must be added £7324 brought forward, making £91,285. After deducting the interim dividend for the half year upon the preference shares, there remains to be dealt with £73,288. The Directors recommend a final dividend on the preference shares, and a dividend of 5 per cent. upon the ordinary shares for the whole year. They add £15,000 to the general reserve, and carry forward the balance of £3130. The reserve account now stands at £90,000. The Directors propose to allocate to the reserve fund the cost of certain freehold premises which were acquired by the Company at King's Cross during the past year; and to release, for the purposes of the business, securities of corresponding value previously allocated to that fund. The freehold premises referred to will, it is anticipated, prove a valuable investment. The greater part of the buildings standing at the time of purchase are being replaced by new ones which, when completed, will provide (with the old buildings utilized) accommodation not only for the purposes of the Company's business, but also premises which it is hoped will be available to let on lease. The wholesale department has been transferred from Westminster to King's Cross, and the year's profits have borne the inevitable expenses connected with the removal. But it is believed that in future substantial benefits will accrue to the Company from the change of premises. The abnormal increase in stock is fully accounted for by extensive and favourable purchases of goods and materials, made before the general advances in price which now rule. The volume of the business again substantially increased during the year; and £6089 has been expended on amplifying the resources of the Company's mantle factory at Wandsworth, and bringing the plant up to date in every respect. During the year one further share in the Austrian Company was bought, raising the holding in the concern to 1471 shares of 1000 gulden (about £83 6s. 8d.) each, out of a total issued capital of 1500 shares. The improved position of the Austrian Company was maintained during the year; and a dividend of 30 per cent. (representing upon this Company's holding about £36,775) will be declared and paid in the course of a few days. This dividend, when received, will form part of the profits of the year 1907-8. The Directors express regret at the death of Mr. T. J. Brinsmead, whose wide experience as a factory specialist contributed so largely to the placing of the undertaking on a sound basis. They also announce with regret the resignation by Mr. Mattinson of his position as Chairman and a Director of the Company. In order to maintain continuity of the policy laid down by the Advisory Committee, the Directors approached Lord Weardale (who, as the Hon. Philip James Stanhope, was the Chairman of the Committee), on the question of filling the vacancy; and he has been appointed Chairman of the Board. Mr. Crompton-Roberts, of the firm of Messrs. Nobles and Hoare, has been elected a Director; and it is proposed to restrict the number of Directors to five.

Saltash Water Supply.—Two meetings of the Saltash Town Council were held last week for the consideration of the question of the water supply. At the first, it was proposed that Mr. Jenkins, of Liskeard, should be instructed to report on the feasibility of obtaining an independent supply for the town, and its cost. It was pointed out that they were paying Plymouth for water a sum equivalent to the sinking fund and interest on a loan of £16,000, and that a local scheme might perhaps be carried out for less than this sum. On the other hand, it was argued that the position had undergone no change since they came to the agreement with Plymouth. The motion was lost. Next day, when the Council again met, the Water Committee reported that the Great Western Railway Company had consented to the water-main being carried across the Royal Albert bridge, on payment of £25 per annum; and they recommended that the terms be accepted. The present 5-inch and 2-inch mains are laid in the bed of the river; and the larger one has always been a source of trouble through leakage. The Committee's recommendation was adopted.

GAS-WORKS RESULTS AT BIRMINGHAM.

In their report which will be submitted to the City Council next week, the Birmingham Gas Committee refer to the successful result of their petition to Parliament against the clause of the King's Norton and Northfield Urban District Council Bill under which the District Council sought to establish, within their district, testing-places in which to test the gas supplied by the Corporation—such tests to be of the same effect as if made at the gas-works of the department.

The Committee state that they have entered into contracts for the supply of stores required for use in the department during the year ending March 31, 1908, at prices generally somewhat higher than those for the past year. In consequence of the development of the Tyseley district for manufacturing and residential purposes, it has become necessary to enlarge the existing mains in Coventry Road between the River Cole and King's Road, and to replace the existing 8-inch main in the ast-mentioned road by one of 12 inches diameter. The cost of this work is estimated at about £1200. The Committee have also decided to continue, at an estimated cost of £6000, the 30-inch trunk main from Coventry Road to Warwick Road. This extension will improve the gas supply to Greet, Tyseley, and Acock's Green.

They submit the statement of accounts and balance-sheet for the year ended March 31, showing a net surplus of £57,563, to be paid to the Finance Committee in aid of the improvement rate of the city. The following are the contributions of the department for public purposes for the year :—

In aid of the improvement rate	£57,563
In aid of the improvement rate (interest on reserve fund)	4,000
In aid of public lighting within the city	9,263
In aid of court lighting within the city	2,281
	£73,108
In aid of public and court lighting outside the city . .	4,240
Total.	£77,348

The report states that Mr. G. Hampton Barber has held the position of Secretary of the department for the past six years, during which time the operations of the undertaking have greatly increased. He has proved himself a very valuable officer—never sparing himself to promote the bests interest of the Corporation; and the continued successful trading has been due in no small degree to his efforts. In May, 1904, the Council, on the recommendation of the Committee, advanced his salary from £1000 to £1200, and the Committee are unanimously of opinion that his services entitle him to a further increase of £200 a year as from June 1; and this they recommend.

DISPOSAL OF GAS PROFITS AT BOLTON.

When the proceedings of the Gas and Lighting Committee were submitted on "budget day" to the Bolton Town Council, Alderman Haslam moved an amendment referring back a paragraph relating to the allocation of £20,000 towards the relief of the rates. Some years ago, he said, the Council passed a resolution practically limiting the amount to be paid by trading departments to the relief of the rates; and as far as he remembered it was to the effect that only 3¼ per cent. be allowed to go in this direction—the remainder to be put to the reserve fund. For two years, they had exceptional circumstances. Great pressure was put on the Gas Committee last year, and the matter was absolutely referred back to them; and they agreed to vote £20,000 out of the profits, with the distinct reservation that it was not to create a precedent. There were, however, no exceptional circumstances this year; and a great hardship was being inflicted on firms who used a large amount of gas for business purposes over and above others who generated their own. The matter was becoming a great infliction, and a very great injustice.

Alderman Brown, the Chairman of the Gas Committee, in reply, said the price of gas was not high in comparison with neighbouring towns; and he did not see why all the profits should go to the reserve fund. If the amount had been kept down to 2¼ per cent., a considerably less sum than £20,000 would have had to be allocated; and the rates would have had to go up. He emphasized the point that it was not decreased expenditure which was reducing the rates, but the amount of profit they were deriving from municipal trading. Mr. Tootill, however, pointed out that £196,000 of the capital account of the Gas Department was still undischarged; and that the Lum Street retort-house was in need of renewal. The department would, he urged, not be on a proper basis till the capital account was reduced to 10s. per 1000 cubic feet. At present it stood at 13s. 5d.

In the result, the amendment was defeated by 37 votes to 26.

HEYWOOD CORPORATION GAS SUPPLY.

The report of Mr. W. Whatmough, the Gas Engineer and Manager to the Heywood Corporation, for the year ending March 31, reveals a very satisfactory state of affairs.

The outlay on capital account amounted to £613; and it was for prepayment meters and new mains and services. The gross revenue was £21,988, and the gross expenditure (less interest and sinking fund), £14,652; leaving a gross profit of £7336, or an increase of £26. The net profit amounted to £1947, or a decrease of £104. The receipts for gas sold were £17,588, compared with £16,994 in the year 1905 6—an increase of £594. The revenue from residuals was £4015, against £4237 before; being a decrease of £222. There was an increase of £367 in the manufacturing account. During the year, 12,604 tons of coal and 167 tons of cannel were carbonized—a total of 12,771 tons of raw material, against 12,783 tons before; being a decrease of 12 tons. The gas made per ton was 10,749 cubic feet, or 165 cubic feet more than in the year 1905·6. The quantity of benzol used was 4843 gallons. The total quantity of gas manufactured amounted to 137,286,000 cubic feet, being an increase of 1,983,000 cubic feet; and the total quantity sold to 126,287,868 cubic feet, or an increase of 4,818,217 cubic feet. The gas not accounted for was 9,753,632 cubic feet, which is equal to 7·14 per cent. The following table shows the various purposes for which gas was used :—

	Cubic Feet.		Per Cent.
Shops and dwellings—			
Ordinary meters	59,126,753	..	46·38
Prepayment meters	11,206,250	..	8·79
Mills and workshops	24,139,100	..	18·93
Public lamps.	5,706,565	..	4·48
Stoves	17,626,100	..	13·82
Motive power	8,483,100	..	6·65
Office, works, show-room, and public clocks	1,204,500	..	·95
Total consumption. . .	127,492,368	..	100·00

The gas consumed in dwellings and shops through ordinary meters shows an increase of 941,826 cubic feet, and through prepayment meters one of 1,565,100 feet. For public lighting there was again a drop of 107,709 feet. For mills and workshops, there was a decrease of 198,350 feet; and for stoves and motive power an increase of 2,617,350 feet. The quantity of gas delivered between 6 a.m and 6 p.m. was 60,609,000 cubic feet, or 44·16 per cent. of the total; and between 6 p.m. and 6 a.m. 76,637,000 feet, or 55·84 per cent.

Mr. Whatmough closes his report with the remark that, considering the increased cost of coal, reduction in value of residuals, and increased rate of interest, he has no doubt the Committee will regard the additional gross profit of £26 as a satisfactory result of the year's working.

HINCKLEY DISTRICT COUNCIL GAS DEPARTMENT.

Annual Report of the Manager.

The Gas Engineer and Manager of the Hinckley Urban District Council (Mr. Fred Lee) has presented to the Gas Committee his report for the year ending the 31st of March. The expenditure on capital account was £1145, which was paid out of profits. The amount paid off the loan account was £1578; leaving a balance still owing of £37,784, equal to 11s. 2d. per 1000 cubic feet of gas sold, compared with 12s. 8d. for the year 1905 6. The total receipts on revenue account were £12,976, compared with £12,176 before; being an increase of £800. The receipts for gas and meter and stove rents were higher by £60; coke, by £103; and sulphate of ammonia, by £105. Mr. Lee says the last item is very satisfactory, as the average price received for sulphate was 8s. per ton less than before. The increase was caused by the larger quantity of coal used, and the greater efficiency of the new sulphate plant. During the year the sulphate made per ton of coal was 26·54 lbs., compared with 24·34 lbs. in 1905·6 and 19 24 lbs. in 1904-5. The working expenses for the year were £7560; showing a gross profit of £5416, or £66 more than in the previous year. Interest and sinking fund payments absorb £2413; leaving a net profit of £3003. Mr. Lee says that if the price of gas for engines and other business purposes had been the same as in the year 1905·6, the profit would have been £290 more. During the period covered by the report, £260 was transferred to the general district rate. The quantity of gas manufactured was 70,314,000 cubic feet, compared with 64,071,000 cubic feet before. The gas sold was 67,861,300 cubic feet, compared with 62,070,700 cubic feet; being an increase of 5,790,600 cubic feet, or 9·32 per cent. The gas used on the works was 1,142,000 cubic feet; leaving 1,310,700 cubic feet, or 1·86 per cent., unaccounted for. This is a remarkably low figure, compared with some recent years, when it was as high as 10 and 11 per cent. The number of ordinary meters in use was 1377, and of slot-meters 1017. The number of cookers on hire was 979, against 817—an increase of 162.

The report came before the Council at their meeting last Tuesday, when Mr. Kinton, in moving its adoption, remarked that they had had a good year's working, and the profit had been increased. It needed no words from him to compliment the Gas Manager on the success that had been achieved. It did him credit. He had shown his usual diligence and attention to the work, and it was a great pleasure on the part of the Committee to report so favourably. Mr. Hill moved, as an amendment, that the price of gas for lighting purposes be reduced 1d. per 1000 cubic feet. He remarked that a sum of £250 had been devoted to the rates, so that those who did not burn gas benefited; and he thought it was only right that the consumers should have some advantage. Mr. Pratt seconded the amendment. Mr. Chapman said he should have liked to support the amendment; but, on the recommendation of the Manager, he felt constrained not to do so, because their officer knew better than they did when they could best afford to reduce the price of gas. The Manager advised the Committee not to lower the price at present. Under the circumstances, he felt compelled to give way. They were delighted with the success of the concern; and if things progressed as they were doing, something substantial would probably be done. But they must get the undertaking into the best possible condition before they took much out of it. Mr. Ridgway said he was strongly in favour of adhering to the report of the Committee. They went thoroughly into the question, and the Manager gave them a good reason for not making a reduction at present. One was the advance in the price of coal, which had lately gone up considerably. They did not propose to increase the price, which many companies would have to do, in consequence of the advance. They were fortunate in having bought sufficient coal to carry them over part of the year, which was owing to the foresight of the Manager. If this had not been done, they would have had to raise the price of gas. Mr. Kinton, in reply, expressed similar views to those held by Mr. Ridgway. They had a balance of about £1300, and to reduce the price of gas 1d. per 1000 cubic feet would absorb £300. If they had had to buy coal at the increased price, they would have had to raise the price of gas 2d. per 1000 cubic feet. On a vote being taken, the amendment was rejected by 10 votes to 5, and the report adopted.

ROTHERHAM CORPORATION GAS UNDERTAKING.

The Manager's Working Statement.

The Engineer and General Manager of the Rotherham Corporation Gas Undertaking (Mr. J. S. Naylor) has presented his working statement for the year ending the 31st of March last, from which we take the following particulars :—

	Total Cost.	Per 1000 Feet Sold.	Per Ton of Coal Carbonized.
Manufacture	£16,616 ..	1s. 3·53d. ..	14s. 2·23d.
Distribution	4,165 ..	0 3·90 ..	3 6·67
Depreciation of meters .	2,546 ..	0 2·38 ..	2 2·08
Lighting and repairing public lamps . . .	1,823 ..	0 1·71 ..	1 6·68
Rates, taxes, &c. . . .	3,238 ..	0 3·03 ..	2 9·17
Management	1,143 ..	0 1·07 ..	0 11·72
Discounts, bad debts, &c.	491 ..	0 0·46 ..	0 5·06
	£30,025 ..	2s. 4·08d. ..	25s. 7·61d.
Less residuals, rental of meters and stoves, and miscellaneous receipts	11,104 ..	0 10·38 ..	9 5·77
Net cost of gas . . .	£18,921 ..	1 5·70d. ..	16 1·84d.
Balance, being gross profit	18,188 ..	1 5·00 ..	15 6·34
Revenue from gas and public lights . . .	£37,109 ..	2s. 10·70d. ..	31s. 8·18d.
Net profit, after paying interest and sinking fund	£8,474 ..	0s. 7·92d. ..	7s. 2·82d.
Less gas for public lamps	1,973 ..	0 1·84 ..	1 8·21
Surplus profit	£6,501 ..	0s. 6·08d. ..	5s. 6·61d.

Compared with the twelve months ending March 31, 1906, the surplus profit was £784 higher—the figure for that year being £5717. This worked out to 5 62d. per 1000 cubic feet of gas sold, and 4s. 9 8d. per ton of coal. During the past twelve months, 23,426 tons were carbonized, and 287,856,000 cubic feet of gas made, or at the rate of 12,287 cubic feet per ton, compared with 11,796 in the preceding year. The quantity sold was 256,696,000 cubic feet; being 89·17 per cent. of the make, against 87·24 per cent. before. The number of consumers at the end of the past financial year was 13,464—an increase of 271; and of public lamps 1285, against 1130.

MANAGEMENT OF THE GLOSSOP GAS COMPANY.

An Important Investigation.

Some months ago, a Committee was appointed to inquire into the past six years' management of the Glossop Gas Company. It consisted of three shareholders and a former Director; and they had, as their technical adviser, Mr. Robert Porter, of Elland. They examined the Chairman of the Company (Mr. J. Duckett), the Manager (Mr. W. Taylor), and the Auditor (Mr. Wainwright). The report of the Committee has been prepared, and it will come before the shareholders at a meeting to be held early next month. The result of their investigation is that, by carrying out some necessary changes, a considerable saving may be effected in the cost of gas manufacture. The present system of making the coal contracts is said to leave much room for improvement; and by the adoption of a better method of carbonization, discontinuing the use of cannel, and obtaining higher results from residuals, substantial economies may be realized. The administration of the undertaking also requires to be reorganized. The points specially worthy of consideration are the early extension of the mains, and the supply of cooking appliances and prepayment meters on sale or hire. While complaining of the present system of management, the Committee express the opinion that the salaries paid to the Directors, Manager, and clerical staff are inadequate, and that efficient services cannot be obtained for the amounts paid. If it is decided to retain the present Manager, they think he should work under a Consulting Engineer to be appointed. Mr. Porter agrees with the Committee on the question of salaries, and considers the amounts paid are altogether inadequate. He deals with the financial position of the Company, and shows how an immediate reduction of 3d. per 1000 cubic feet could be made in the price of gas without prejudice to the interests of the shareholders. With regard to the plant, while he acknowledges that proper attention and supervision have been given to it, and good results obtained, he says it is out of date. It appears that the Manager has been forbidden to supply meters, grillers, and cookers unless they are purchased by the consumers. This is characterized by Mr. Porter as a "policy of ignorance" which cannot long prevail. He concludes by expressing an opinion that a saving of £2647 per annum could be effected on the revenue account; and this, he says, would provide for additional capital employed, and allow of increased remuneration of the Directors and officials, and a reduction in the price of gas.

Gas Lighting at South Brent.—A definite beginning has been made with the scheme initiated by the Devon Gas Association for the supply of gas in the village of South Brent. Last week the projectors of the scheme invited a number of the leading inhabitants and tradesmen to a luncheon, at which the project was discussed. Mr. F. Templer Defree, of Exeter, the Chairman of the Association, explained that there would be an opportunity for local people to invest in the enterprise, if they cared to do so, but that in any event the Association would proceed with the scheme. He pointed out that gas was very much cheaper than electric light, and said that if they had the co-operation of those who would benefit by the increased comfort of better lighting, the enterprise would be a great success. The Vicar and the Lord of the Manor both spoke in support of the scheme and the need of better lighting; and there was a general promise of support.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The action by Messrs. Muir and Son, Limited, brewers, of Calton Hill Brewery, Edinburgh, against the Edinburgh and Leith Gas Commissioners, was mentioned in the Second Division of the Court of Session on Thursday. The pursuers sue for £10,000 as damages for the pollution of the Stable Well in their brewery by tarry matter from the gas-works. In June, 1905, Lord Ardwall, after proof, gave decree against the Commissioners for £3730, and expenses. This decision was reclaimed against by the Commissioners, who asked, and obtained, time to sink a shaft and to drive mines, with a view to ascertaining where the polluting material had its source. This work has now been carried sufficiently far to satisfy the Commissioners that the pollution does proceed from the gas-works. I was informed by one of them several weeks ago that the source of the pollution was an old gasholder, and that they were engaged in taking out the whole of the polluted material, right down to the well, with a view to their being able to say that they had effectually removed the pollution, and then applying for a reduction of the amount awarded. The technical position of the case was that it was standing over for additional proof—proof as to the result of the operations. This week the Commissioners approached the Court with a note, in which they stated that they did not now propose to proceed with the proof fixed for the 20th of May, or to go to proof further, and were desirous that the diet of proof should be discharged, and that the case should be put out again in the roll for further hearing. This was agreed to. The case will come up for hearing, upon the effect of the discovery and disposal of the question of expenses, which will be a very large item. The Commissioners can scarcely hope to get rid of any part of the cost of the work they have been carrying out; but there would be more reason if they were to ask to be relieved of part of the general expenses incurred in the case. They have been obliged to admit that they were in the wrong; but the case for the pursuers was erroneously stated, and, in consequence, much unnecessary expenditure was incurred. As the case will have to take its turn, there is every probability that it will not be reached for some time—probably not till October. Delay, however, will not be of so much consequence now, and, indeed, may be a benefit, by allowing a thorough test of the remedial measures which have been taken by the Commissioners.

In the Glasgow Town Council on Thursday, approval was given to a recommendation by the Committee on the Emission of Black Smoke that two houses in the Improvement Trust's property in High Street should be taken for a period of six months, at a rental of £9 each, for the purpose of conducting experiments in the use of gas-stoves. The subject of the more general use of these stoves in dwelling-houses, with the view of purifying the atmosphere, was some time ago remitted to the Sanitary Inspector, the Gas Engineer, and the Corporation Chemist, for consideration; and it was upon their recommendation that the Council resolved to have experiments conducted.

In the "Dundee Advertiser" of yesterday's date, it was stated that the accounts of the Dundee Gas Department for the year just ended promise well. The consumption for the period in question has increased to the extent of about 7 per cent. Notwithstanding the abnormal rise in the price of coal, there will be a surplus after all charges are met. It is authoritatively stated that, having regard to the high values ruling in the coal market, no reduction in the price of gas can be looked for.

In the minutes of the Gas Committee of the Arbroath Town Council, submitted to the Council on Monday, it was stated that the tenders for coal showed that the average increase in the price had been 3s. per ton in the case of gas nuts, and 3s. 3d. to 3s. 6d. in the case of large gas coal and of cannel and shale. It had been mentioned that, owing to the rise in the price of coal, the price of gas would probably have to be increased from 2½d. to 5d. per 1000 cubic feet; but it appeared from a statement afterwards prepared by the Manager that, if the estimated profit on the working for 1906-7 should be realized, an increase of 2½d. per 1000 feet would suffice for the year.

The annual meeting of the Newburgh Gaslight Company was held on Monday. A balance of profit amounting to £134 was reported. It was agreed, in view of the prospect of having to erect a new gasholder, at a cost of over £500, to restrict the dividend to 4s. 2d. per share, and to raise the reserve fund from £100 to £170.

At the monthly meeting of the Largs Town Council on Tuesday, the award of the Arbitrators in the acquisition of the undertaking of the Largs Gas Company was submitted. The sum awarded is £27,990. The amount of the share capital of the Company was stated in the last balance-sheet to be £13,295—consisting of 2659 shares of £5 each. The dividend paid was at the rate of 8 per cent. Provost White stated that the Arbitrator for the burgh—Mr. A. Yuill, of Dundee—had satisfied him that the price was a reasonable one. Bailie Paton considered that 10 per cent. upon the capital was too much to allow for compulsory purchase. The whole Council have been appointed a Gas Committee; and it has been resolved to take over the services of the officials of the Company. The works are to be transferred on Wednesday.

Contrary to general expectation, the Earl of Camperdown's Committee rejected the proposal of the Corporation of Glasgow to acquire the undertaking of the Busby Water Company, and approved of the proposal of the Renfrew County Council to acquire it. This decision will probably delay for some years, at least, what is understood to be in the air—a large extension of the boundaries of the City of Glasgow in the southern district.

Public Companies and Municipal Extravagance.—The "Financial News" last Thursday devoted an editorial paragraph to the letter on the above subject addressed by Mr. Frank Bush, the Secretary of the South Metropolitan Gas Company, to the Board of Trade, which will be found in our "Parliamentary Intelligence." Our contemporary quotes freely from the letter; and with regard to the concluding portion, as to taxation without representation, says: "This is exceedingly well put, and echoes what we have ourselves many times urged on the subject."

CURRENT SALES OF GAS PRODUCTS.

Week ending May 18.

LIVERPOOL, *May* 17.

Sulphate of Ammonia.

The firmer tone in the market noticed a week ago has been sustained, and all ready parcels have been absorbed at slightly hardening prices. The closing quotations are consequently £11 16s. 3d. per ton f.o.b. Hull, and £11 17s. 6d. to £11 18s. 9d. per ton f.o.b. Liverpool and Leith. The greater interest in the forward position has resulted in a very considerable business, at £11 17s. 6d. per ton f.o.b. Leith for July-December delivery, and at £12 per ton for January-March, and similar prices have been paid at other ports. At the close, an advance is required, and in some cases it is reported to have been paid.

Nitrate of Soda.

This article is quiet at last week's prices.

LONDON, *May* 17.

Tar Products.

There is very little business doing in tar products, doubtless owing to the holidays; and probably we shall not have a revival to any considerable extent until the week after next. In pitch, there is no business doing in London for prompt delivery, as manufacturers have sold all they desire to place this season, with the exception of one or two small makers, who would perhaps accept a low price to clear a few hundred tons. On the east coast, business has been done at 25s. 6d., and on the west coast at 24s., for delivery between now and June. For forward delivery, there is a distinctly better tone on this side; and makers are very firm in their ideas, though at present dealers do not seem inclined to pay the prices asked by them, owing to the absence of demand from the Continent. Creosote is still very firm. In London, oil has been sold at 2¼d. and at 2⅜d. One parcel was reported to have been sold at 2⅜d.; but this is a very low figure indeed, and probably 2⅜d. would now be freely paid. In the Midlands, makers have realized 2¼d., and will not give consideration at present to anything under 2¾d. In the North, business has been done at 2¼d.; but, in most cases, manufacturers refuse to quote. Benzol 90 per cent. is still depressed, and very low prices are talked of; North country makes particularly having been placed at very low figures. Benzol 50-90's are weak in sympathy with 90's and toluol. For the latter article, there has not been any demand, and there is none at the moment. One maker reports having offered at 1s. 2d. without result. In crude carbolic acid, a very large business has been done in 60's to the end of the present year at 1s. 7½d.; but during the last day or two prices have been slightly better, doubtless owing to dealers who sold a little time ago covering in. Crystals are purely nominal—makers offering at 5¾d. for 39-40's. and 5½d. for 34-35's.; but they would doubtless accept a firm offer at less than this. Solvent naphtha is fairly steady, though there is not much alteration in prices; and there is but little difficulty in buying at the market quotation. High-flash naphtha is also decidedly easier than was the case some time ago. Heavy oils are in good demand, and prices are well maintained. No sales of importance are reported in anthracene; makers refusing figures offered by consumers.

The average values during the week were: Tar, 15s. to 19s.; pitch, London, 26s. nominal; east coast, 25s. to 25s. 6d.; west coast, 24s. to 24s. 6d. Benzol, 90 per cent., 8d. to 10d.; 50-90 per cent., 9¾d. to 10¾d. Toluol, 1s. 1d. to 1s. 1½d. Crude naphtha, 4½d. to 4¾d.; solvent naphtha, 1s. 2d. to 1s. 3½d.; heavy naphtha, 1s. 2d. to 1s. 3½d. Creosote, London, 2½d. to 2⅝d.; North, 2¼d. Heavy oils, 2⅞d. to 3d. Carbolic acid, 60 per cent., 1s. 7½d. to 1s. 8d. Naphthalene, £6 10s. to £10 10s.; salts, 35s. to 40s. Anthracene, "A" quality, 1½d. to 1¾d.

Sulphate of Ammonia.

There has been a decidedly better tone in this market during the past week, and prices have got steadily harder, to the extent of about 2s. 6d. all round. The principal London Companies first raised their quotation to £11 17s. 6d., and afterwards to £12, upon their terms, though perhaps they would accept a firm offer at a little under this. Outside London, makers are reported to have sold at £11 12s. 6d., on Beckton terms. In Hull, no business is reported; but the value is said to be £11 13s. 9d. In Liverpool, business has been done at £11 15s. and £11 16s. 3d. In Leith, £11 16s. 3d. has been paid for prompt; and £11 17s. 6d. for forward delivery over the next few months has been offered without result, makers holding out for £12.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The present week being the greatest holiday week of the year in Lancashire, a temporary stoppage will be caused to all the great industries for which the county is famous. There will be a lull in coal consumption; and the colliers themselves will have a week's holiday. Coal of all kinds is in strong request, which the holidays will tend to steady somewhat, but only temporarily. The general trades of the district are in the most satisfactory condition; and so great is the demand for engine fuel for factory, foundry, workshop, and mill, that the falling off in house coal has no effect on the market. Prices of coal for domestic purposes continue at the high rates last quoted, and there is no prospect of any easement. Colliery owners intimate that, so far as can be judged from existing conditions, there will be no alteration in prices before the autumn, if even then.

Scotch Coal Trade.

Trade is again going quietly, the demand for export not being so great as was expected. Quotations have not, however, eased to any appreciable extent, which is attributed to the fact that some large consumers have begun to stock coal. The prices quoted are: Ell 12s. to 13s. 6d. per ton f.o.b. Glasgow, splint 12s. 3d. to 12s. 6d., and steam 11s. 9d. to 12s. The shipments for the week amounted to 300,733 tons—an increase of 4422 tons upon the preceding week, and of 6953 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,813,574 tons—an increase of 99,851 tons upon the corresponding period of 1906.

Northern Coal Trade.

There is a full demand for most kinds of coal—the holidays influencing the requirements for stocking, and the shipments to the Baltic

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 506.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	20–21	+1	5 0 0
268,324	10	,,	7⅞	Do. 7 p.c.	14–15	..	5 0 0
200,000	5	May 15	7	Bombay, Ltd.	6½–7*	..	5 0 0
40,000	5	,,	7	Do. New, £4 paid	4¾–5⅛*	..	5 6 8
50,000	10	Feb. 28	14	Bourne- and Water } 10 p.c.	27½–28½	..	4 18 3
51,810	10	,,	7	mouth Gas } B 7 p.c.	16½–17	..	4 2 4
53,200	10	,,	6	and Water } Pref. 6 p.c.	15–16	..	3 15 0
380,000	Stk.	,,	12½	Brentford Consolidated	245–250	–3	5 0 0
300,000	,,	,,	9¾	Do. New	190–195	..	4 17 5
50,000	,,	,,	5	Do. 5 p.c. Pref.	117–122	..	4 2 0
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	101–104	..	3 16 11
220,000	Stk.	Mch. 14	11½	Brighton & Hove Orig.	220–225	..	5 0 0
246,320	,,	,,	8½	Do. A. Ord. Stk.	160–165	..	5 0 0
460,000	20	Apl. 11	10	British	42½–43½	..	4 11 11
104,000	Stk.	Feb. 28	6	Bromley, Ord. 5 p.c.	119–122	..	4 18 4
165,700	,,	,,	4½	Do. do. 3½ p.c.	90–93	..	4 16 9
500,000	10	May 15	7	Buenos Ayres (New) Ltd.	11–11¼*	..	6 1 9
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	95–97	+1	4 2 6
150,000	20	Mch. 14	8½	Cagliari, Ltd.	24–26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	12–14	..	7 2 10
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.	8½–9½	..	4 14 9
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	50–52	..	5 15 5
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	56–98	..	4 11 10
157,150	Stk.	Feb. 28	5	Chester 5 p.c. Ord.	109–111	..	4 10 1
1,443,280	Stk.	,,	5 5/16	Commercial 4 p.c Stk.	107–110	..	4 14 6
560,000	,,	,,	5	Do. 3½ p.c. do.	103–106	..	4 14 4
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	83–85	..	3 10 7
800,000	Stk.	,,	6⅛	Continental Union, Ltd.	118–122	–½	5 6 7
200,000	,,	,,	7	Do. 7 p.c. Pref.	138–143	..	4 17 11
460,170	Stk.	—	5⅛	Derby Con. Stk.	122–124	..	4 8 9
55,000	,,	Jan.	4	Do. Deb. Stk.	103–105	..	3 16 2
486,090	10	Jan. 31	11	European, Ltd.	24–25	..	4 8 0
354,060	10	,,	11	Do. £7 10s. paid	18–19	..	4 6 10
15,203,110	Stk.	Feb. 14	4 4/16	Gas- } 4 p.c. Ord.	92–94	–1	4 13 6
2,600,000	,,	,,	3⅛	light } 3⅛ p.c. max.	87–89	..	3 18 8
3,799,735	,,	,,	4	and } 4 p.c. Con. Pref.	102–105	–1½	3 16 2
4,193,975	,,	Dec. 13	3	Coke } 3 p.c. Con. Deb.	83–85	..	3 10 7
258,740	Stk.	Mch. 14	5	Hastings & St. L. 3½ p.c.	95–100	..	5 0 0
82,500	,,	,,	6⅛	Do. do. 5 p.c.	116–119	..	5 9 3
70,000	10	Apl. 26	11	Hongkong & China, Ltd.	13–20	..	5 10 0
4,940,000	Stk.	May 15	8	Imperial Continental	170–175*	–1	4 11 5
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.	93–95	..	3 13 8
184,602	Stk.	Mch. 14	6	Lea Bridge Ord. 5 p.c.	117–122	..	4 18 4
306,083	,,	Dec. 28	4	L'rpool Unit'd Deb. Stk.	110–112	..	3 11 5

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
561,000	Stk.	Feb. 28	10	Liverpool United A.	223–225	..	4 8 11
718,100	,,	,,	7	Do. B.	164–165	..	4 4 10
144,140	Stk.	Feb. 14	7⅜	Maidstone 5 p.c.	142–147	..	5 3 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼–4¾	..	5 5 3
560,000	100	Apl. 2	5	Met. of } 5 p.c. Deb.	100–102	..	4 18 0
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	100–102	..	4 8 3
541,920	20	Nov. 14	3¾	Monte Video, Ltd.	11½–12½	..	5 12 0
1,775,892	Stk.	Feb. 28	4⅜	Newc'tle & G'tesh'd Con.	106–107	..	4 6 5
406,025	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	96–97	..	3 12 2
15,000	10	Feb. 28	10	North Middlesex 10 p.c.	19½–20½	..	4 17 7
55,940	10	,,	7	Do. 7 p.c.	13–14	..	5 0 0
300,000	Stk.	Apl. 26	8	Oriental, Ltd.	148–153	..	5 4 7
60,000	5	Mch. 27	7	Ottoman, Ltd.	6–6½	..	5 7 8
398,490	5	May 15	7	Primitiva Ord.	6¾–7¼*	..	4 16 7
796,980	5	Jan. 31	5	Do. 5 p.c. Pref.	5–5¼	..	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	95–97	..	4 2 6
1,000,000	10	Apl. 26	8	River Plate Ord.	12¾–13¼	..	6 0 9
312,650	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95–97	..	4 2 6
250,000	10	Mch. 27	8	San Paulo, Ltd.	12½–13	..	6 3 1
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48–50	..	5 0 0
135,000	Stk.	Mch. 14	10	Sheffield A	245–247	..	4 1 0
209,984	,,	,,	10	Do. B	245–247	..	4 1 0
523,500	,,	,,	10	Do. C	245–247	..	4 1 0
70,000	10	Oct. 26	10	South African	15½–16½	..	6 1 3
6,350,000	Stk.	Feb. 14	5½	South Met., 4 p.c. Ord.	121–123	–2	4 9 5
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	83–85	..	3 10 7
201,720	Stk	Mch. 14	8	South Shields Con. Stk.	158–160	..	5 0 0
605,000	Stk.	Feb. 28	5½	S'th Suburb'n Ord. 5 p.c.	120–123	..	4 9 5
60,000	,,	,,	5	Do. 5 p.c. Pref.	120–123	..	4 1 4
117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	125–130	..	3 16 11
502,310	Stk.	May 15	5	Southampton Ord.	105–110*	+½	4 10 11
120,000	Stk.	Feb. 28	6½	Tottenham } A 5 p.c.	123–126	..	5 3 2
398,940	,,	,,	5	and } B 3½ p.c.	101–103	..	4 17 1
137,500	,,	Dec. 28	4	Edmonton } 4 p.c. Deb.	101–103	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.	10½–11	..	7 5 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	102–104	..	4 16 2
193,742	Stk.	Feb. 28	5	Tynemouth 5 p.c. max.	105–107	..	4 13 6
30,000	Stk.	Feb. 14	8	Wands- } A 5 p.c.	—	..	—
255,636	,,	,,	6½	worth } B 3½ p.c.	135–140	..	4 12 10
75,000	,,	,,	5⅝	and } C 3½ p.c.	111–113	..	4 19 1
79,416	,,	Dec. 28	3	Putney } 3 p.c. Deb. Stk.	79–82	..	3 13 2
843,872	,,	Feb. 28	5½	West Ham 5 p.c. Ord.	101–104	..	4 18 6
185,000	,,	,,	5	Do. 5 p.c. Pref.	120–123	..	4 1 4
228,300	,,	Dec. 28	4	Do. 4 p.c. Deb. Stk.	102–105	..	3 16 2

Prices marked * are "Ex div."

being now heavy. In steam coals, best Northumbrians are quoted from about 14s. 9d. to 15s. per ton f.o.b. For second-class steams, the price is from 14s. to 14s. 3d., and for steam smalls there is a full inquiry at about 10s. In the gas coal trade, the shipments are heavy, both to home users and also to foreign countries—the Baltic trade now adding appreciably to the export. For occasional cargoes, the price of Durham gas coals varies from about 12s. 6d. to 13s. 6d. per ton f.o.b.; and the large output seems to be well taken up. As to the contracts that are in the markets, the tenders have now been sent in for the largest of these; but, of course, the exact figures will not be known until there has been consideration by the Directors. It is stated, from the point of view of some of the tenderers, that the price may be about 3s. per ton above those of a year ago. In coke, the market is firm; and gas coke is steady at from 14s. 6d. to 15s. 3d. per ton f.o.b. The output is now limited; and the price seems likely to be maintained.

Assessment of the Bradford Water Undertaking.

On the Water Committee informing the Bradford City Council that steps had been taken to appeal against the valuation for poor-rate purposes placed by the Assessment Committee on water-works property within the Bradford Union, Mr. Geldard asked why the Committee had appealed to Quarter Sessions instead of endeavouring to arrange the matter amicably with the Assessment Committee. Mr. Land replied that there was a strong desire on both sides to reach an amicable settlement; and he yet hoped that the efforts would be successful. The Committee had given notice of appeal because they could not help themselves. Had they not done so, they would have had no standing. Mr. Glyde understood that a contested appeal would cost anything from £700 to £1000, which would go into the pockets of professional men. It was, he said, a scandalous shame if the Water Committee had no more sense than to throw money away in this manner. Mr. Johnson pointed out that in the first instance the assessment of the water-works was increased threefold; and this was afterwards reduced to double the previous amount. All the efforts of the Water Committee to get some further reduction had been opposed. The Assessment Committee wanted to get £8000 out of one of the municipal trading concerns, in order to be able to show for the rest of Bradford an apparently lower assessment. Mr. Land said the Water Committee were as much concerned for the saving of public money as were the Assessment Committee. They had done all they possibly could to compromise the matter; but their offers had not been accepted. They were bound to give notice of appeal; and in so doing they acted with the concurrence of the Clerk to the Assessment Committee.

The Hyde Corporation have resolved to ask the Local Government Board for sanction to borrow £11,000 for water purposes.

Reduced Rates v. Cheaper Gas for Heating and Power.

In a letter in a recent issue of the "Rotherham Advertiser," Mr. T. G. Marsh again deals with the question of the allocation of gas profits in relief of the rates. His remarks were called forth by the discussion in the Rotherham Town Council reported in the "JOURNAL" last week. He expresses his pleasure at seeing a considerable number of councillors in Rotherham as well as in other towns recognizing the fallacy of the over-distribution of gas profits in relief of the rates. He says the question appears to be whether or not it is politic to make the gas consumer pay a considerable proportion of the rates of the non-gas consumer—in fact, whether it is "good business" to kill the goose that lays the golden eggs. He points out that gas consumers who use gas simply as an illuminant are obtaining light at fully 70 per cent. less cost than in the old days, consequent upon the improved burners now in use. He therefore thinks that in any re-arrangement of prices the users of lighting gas should not participate in the benefits. On the other hand, if gas manufacture must hold its own, to say nothing of increasing, the business must be expanded in the direction of the use of gas for heating and the production of power. He says he is convinced that a reduction in price for heating gas would give such an impetus to the demand that the profits, instead of being lessened, would be most materially enhanced, and that any further capital expenditure required would be less than one-half of what it is now per million cubic feet of gas sold. In making these statements, Mr. Marsh says he has the sympathy of most progressive men, though he knows that in suggesting this course he will meet with many rebuffs. The sale of gas for heating purposes at a reduced price would, he submits, lead to an even greater expansion in sales than that which followed the introduction of penny-in-the slot meters; and the consumers being individually users of much larger quantities, the attendant expenses would be less, and the profit would be very much larger.

Public Lighting of Chapel-en-le-Frith.—At the annual meeting of ratepayers in the Chapel-en-le-Frith lighting area, it was announced that the Rural District Council needed £120 to light the streets during the next season. Mr. Mabbott declared that it was time definite action was taken with regard to the gas-works; and the way to get something done was to refuse supplies. There had been an inquiry of some kind; and the information ought to be before the ratepayers. The Chairman (Mr. John Bennett) said that if the ratepayers refused to pass the budget, the town would be in darkness. It would not be wise to lay the information before the ratepayers until it was complete. He considered the action showed an utter want of confidence in the Council. Mr. Lingared said they had a right to know how the proprietor obtained his 10 per cent. profit, and whether he made any more or not. It did no good to keep the accounts from the public. The Chairman appealed to the meeting to vote the money; but they declined to do so. They also selected several gentlemen to represent them on the Lighting Committee, in conjunction with six members of the Council.

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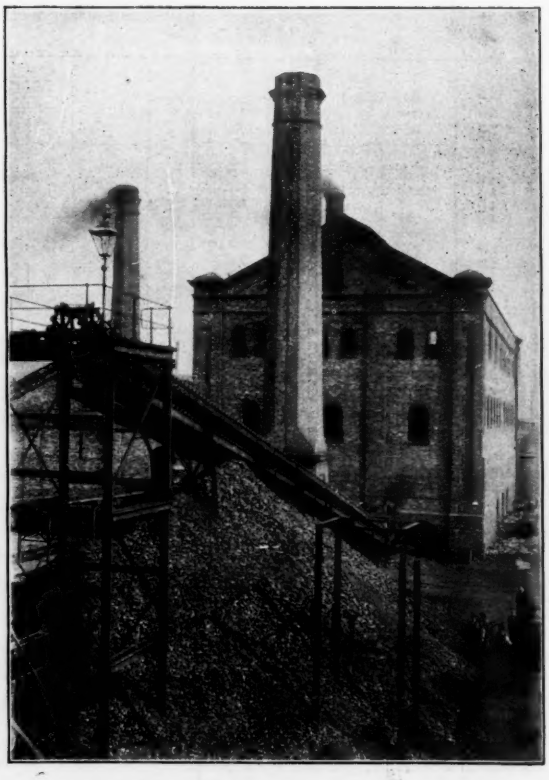

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Portsmouth Water Company.

In the report for the six months ending the 31st of March, which the Directors of this Company will present at the half-yearly general meeting next Thursday, they state that the available balance on the profit and loss account is £28,057, out of which they recommend the payment of the full statutory dividends, and the allocation of a sum of £1000 to the contingency fund. This, after deductions for void houses, &c., will leave a balance of about £8576 to be carried forward. During the half year, 2325 yards of additional street mains were laid—making a total of about 63½ miles of trunk mains, and 154 miles of service mains. The number of additional services connected with the mains was 542; making the total number of premises now under constant supply 47,382. The quantity of water pumped from Havant and Bedhampton during the six months was 1,388,563,809 gallons, or an average daily supply for all purposes of 7,629,471 gallons; being a decrease of 33,166 gallons daily as compared with the corresponding period of last year. The quantity supplied for domestic use was equal to an average of about 23·95 gallons per diem per head of the population, exclusive of all supplies by meter. Having regard to the requirements of the Company's Act of last year relating to the filtration of the water, and in order to insure that the works to be constructed should be such as to render it certain that the water should be "effectually filtered," the Directors submitted the proposals and designs of their Chief Resident Engineer, Mr. Herbert Ashley, M.Inst.C.E., to Professor Percy Frankland, F.R.S., and also to Mr. Charles Hawksley, M.Inst.C.E., and they have since given instructions for the necessary detailed plans and drawings to be prepared with a view to obtaining tenders for the construction of the works.

Sheffield Water Supply.—At a recent meeting of the Sheffield City Council, it was announced that the Little Don Valley water scheme, which has cost £911,000, had been completed. There are two reservoirs—the Langsett and the Underbank. The former reservoir has an area of 120 acres, a drainage area of 5203 acres, and a capacity of 1400 million gallons. The extreme depth is about 100 feet. The surface area constitutes a lake 1¼ miles in extent. The length of the embankment on the Upper Midhope side is 1200 feet, the width at the base 700 feet, and at the top 36 feet. The concrete trench is 12 feet wide, with an average depth of 85 feet; the greatest depth being 119 feet. The Underbank reservoir, when filled, will be wholly used for compensation water. The embankment is 1600 feet long, 350 feet wide at the base, and 32 feet at the top road level. The capacity of this reservoir is 650 million gallons. The total yield of the Little Don watershed is 11,286,201 gallons per day, of which 4,516,712 gallons are to be sent down the stream as compensation water for millowners; leaving 6,769,489 gallons for the domestic supply. When the Derwent Valley water undertaking is completed, the Sheffield Corporation will have a daily supply of 22,270,521 gallons, which is sufficient for a population of 750,000. The present population is only about 450,000.

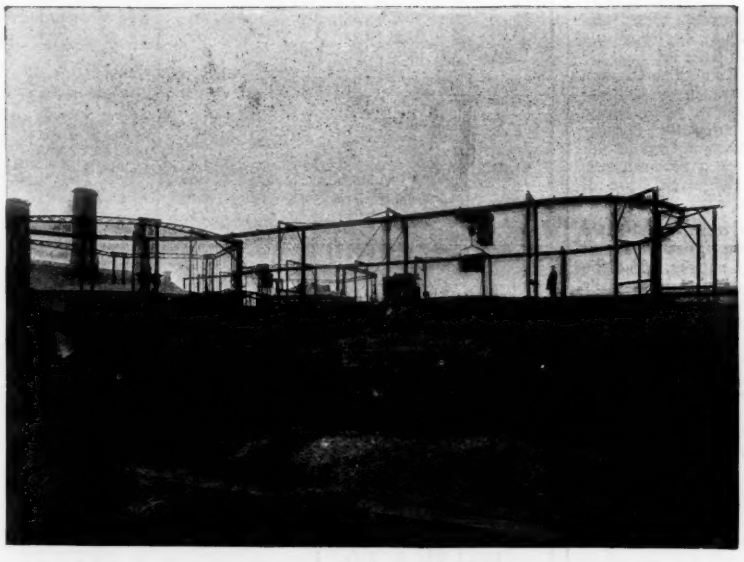
Tiverton Gas Undertaking.

A report was presented to the Tiverton Town Council on Tuesday last, showing that the working of the gas undertaking for the year ending March 31 had resulted in a net profit of £364. Mr. J. Thorne, the Chairman of the Lighting Committee, said the result was very satisfactory, especially as the reduction in the price of gas made last June represented a sum of £386. The gratifying position of the undertaking was due to the improvements in the plant carried out at the suggestion of the Manager (Mr. Clarke Jeffery), who had conducted the affairs of the department in a very able manner. The progress made was excellent. Ten years ago they received £4649 from the sales of gas; while last year the amount was £6491. In the first of these years, the gross profit was £1838; and last year it had grown to £2500. The number of cooking-stoves in use had increased in the ten years from 110 to 638; and the number of consumers had grown to 1187. It was a satisfactory feature that the Manager was held in good repute among the consumers; and the Chairman of the Lighting Committee had no longer to stand as a buffer between the Manager and the consumers. Mr. Thorne explained that of the gross profit realized £988 had been devoted to interest, and £1150 to paying off loans.

Arrears of Water-Rates in London.—The Law and Parliamentary Committee of the Metropolitan Water Board recently furnished to the Board particulars in regard to the legal proceedings taken in connection with the arrears of water-rate, and presented tables showing the position for the two years ended March 31 last. In the twelve months ended March 31, 1906, there were 7352 cases referred to the Solicitor; while only 3639 cases were sent to him in the year recently ended. This large diminution in the number was stated by the Committee to be due to the fact that the cases are not now referred at so early a date as was formerly the practice.

Cookery Lectures at Reading.—Miss Thwaites has lately been delivering an interesting series of lectures on cooking by gas, in the lecture room of the Reading Gas Company, at their central offices. The lectures in the evenings were mainly on artisan cookery, and those in the afternoons on higher class cookery. They were greatly appreciated by those who heard them; and though they were held on only eleven days, some 1300 people attended. Miss Thwaites explained that the Company's object in engaging her to deliver the lectures was to instruct their customers as to the best mode of using a cooker, and how to avoid wasting gas when so doing. As regards the economy of a cooker, Miss Thwaites pointed out that fuel is only consumed when necessary, and in strict proportion to the work to be done; whereas coal-ranges use fuel all day, and practically as much is used to cook a chop as to turn out a dinner. Miss Thwaites also referred to the great comfort of a gas-cooker, especially in summer, when kitchens could be kept cool and clean, and hot food or drink obtained promptly at any hour of the day or night.

TEMPERLEY TRANSPORTERS



Temperley Transporter Plant for Storing Coke at the Paisley Corporation Gas-Works. The same plant is used for screening and loading into delivery carts.

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BY MEANS OF GRABS OR PATENT AUTOMATIC DUMPING BUCKETS.

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72, Bishopsgate Street Within, LONDON, E.C.

Telephone: 365 LONDON WALL.
Telegrams: "TRANSUMO, LONDON."

NO BREAKAGE OF COKE if you use Temperley Transporters.

A Strand Gas Explosion.—As the result of an explosion in a Strand public house last Tuesday, two men and a boy were injured; the gas having become ignited in the customary manner—that is, through searching for a leak with a naked light. The sufferers were promptly removed to King's College Hospital.

Electricity a "Serious Burden" at Rhyl.—According to the Chairman of the Rhyl Urban District Council Finance Committee, who has the best of opportunities for judging, the electric light undertaking continues a serious burden on the ratepayers; and if the town had not embarked in this alluring form of municipal trading, it would have been in a very healthy financial position, with a decrease in the rates. The annual loss on the concern has, he says, steadily increased, in face of the fact that they might reasonably have hoped to get a larger revenue.

Decreased Price and Increased Revenue at Evesham.—At the quarterly meeting of the Evesham Town Council last Wednesday, the Mayor (Mr. W. A. Fisher) gave a statement as to the working of the Gas Department for the year ended March 31. Though the price of gas had been reduced 5d. per 1000 cubic feet, the total receipts for the year (£8114) showed an increase of £157. The expenditure amounted to £6036, leaving a balance of £2078. Of the balance on the revenue account, £729 was written off capital account, interest on loans amounted to £111, and instalment of loans to £756; leaving a balance to carry forward of £481. Of a loan of £15,000, £12,264 had been repaid out of revenue. They had one more payment to make in November next of £290, when the largest loan would be paid off, relieving the department to the extent of £580 per annum.

Mining Operations and Unaccounted-for Gas.—The Sedgley Gas Committee have reported to the Urban District Council that the quantity of gas unaccounted for during the year ended March last was 4,713,000 cubic feet, representing an increase in the leakage of 1,354,300 feet compared with the previous year, and amounting to over 16 per cent. of the total make. This abnormal loss was put down to mining operations, though a large quantity of gas was wasted through a broken main. The Manager has been authorized to take such steps as he may find advisable for the lessening of the leakage. Nearly 2,000,000 cubic feet have been lost during the first three months of the present year; and it is believed that the bulk of this was due to mining operations. The total leakage for the past year would, if it could have been sold, have yielded an amount equal to nearly half the sum realized by the district rate.

Gas Matters at Burslem.—The Burslem Gas Committee have appointed their Chairman and Vice-Chairman to discuss, with a deputation representing the Wolstanton Urban District Council, the claim for pipes, mains, and fittings, to be purchased from Burslem by Wolstanton. They have also recommended (and the Council have adopted the suggestion) that the sum of £1500 should be applied out of the profits of the gas undertaking in relief of the district rate; £750 to be paid on Sept. 29 next., and the remaining £750 on March 25, 1908. The Gas Manager (Mr. Edward Jones) has presented a report relating to houses in the borough not fitted with proper means of lighting; and he has been authorized, on receipt of applications signed by the landlords and tenants, to fix installations on the slot-meter system—the cost of the work being defrayed out of the charge for gas consumed, which is to be 3s. 4d. per 1000 cubic feet until the cost of the work shall have been repaid.

Worthing Gas Bill.—On Tuesday week, a discussion took place in the Worthing Town Council regarding the Gas Company's Bill. Mr. Chignell asked the members to declare "that the erection of gas-works on the site proposed at Goring would be injurious to the town of Worthing and prejudicial to its future development." He was supported by several councillors; but the resolution was lost by a majority of one. Strong opposition to it was offered by Alderman Piper and Alderman White. It was, the former said, an endeavour by a side wind to place before the House of Lords an opinion from the Council which would be equivalent to a petition against the Bill. The Council had secured, by their negotiation with the Gas Company, the amendment or deletion of clauses which they considered might prejudicially affect Worthing, and had been able to impose conditions. Having obtained these concessions on the understanding that they would not oppose the Bill, was it fair and honest to pass such a resolution as this? Alderman White also argued that the resolution would have all the effect of a petition against the Bill in the Lords.

Water Supply of Princetown.—Though Princetown is situated right upon Dartmoor, where the rainfall is apt to be too abundant at times, difficulties have arisen respecting the water supply. For the most part the inhabitants are dependent upon wells and springs, while the convict establishment is supplied by means of an open leat, which conveys water from the River Walkham, and is thought by some people to be objectionable because of the presence of peaty matter. A scheme for the supply of the place has been prepared by Mr. H. F. Bellamy, of Plymouth, at the instance of the Tavistock Rural District Council. It is proposed to utilize the overflow from the leat. The water would first pass into a subsiding tank of 3750 gallons, and thence be syphoned to filter-beds, which would be in duplicate, and each capable of dealing with 10,000 gallons per day. A covered reservoir would be provided for the pure water, and 3 and 4 inch mains laid for distribution. The District Council are in favour of the scheme; but members of the Parish Council contend that it will be inadequate in summer, and that even filtration will not make the water palatable.

The Hythe and Sandgate Gas Company have placed an order with Messrs. Biggs, Wall, and Co., for a complete methane-hydrogen gas installation.

The Directors of the Continental Union Gas Company, Limited, have decided to pay an interim dividend on the ordinary stock of 3 per cent., free of tax, for the past half year (being at the rate of 6 per cent. per annum), together with the half-yearly dividend of 3½ per cent. on the preference stock, the latter less income-tax.

THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.

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AGENTS FOR SCOTLAND:

D. M. NELSON & CO., 53, WATERLOO STREET. GLASGOW.

The Joint Water-Works Committee at Haywards Heath have decided to apply to the Local Government Board for permission to raise £3000 for purposes of water supply.

The Rhyl Gas-Works (under the management of Mr. Leonard G. Hall) continue to be a great source of profit; the result of last year's working being a net gain of £1492—the largest yet recorded.

Messrs. Joseph Taylor and Co., of Bolton, have received a repeat order for one of their best and latest makes of solid plate-lead saturators, from the representatives of the late Mr. John Wedgwood, Bignall Hill Collieries. These saturators replace copper ones. The firm have also had orders for solid plate-lead saturators for the Selkirk Gas Company, and for a 12-ton acid tank, with cover, seal-pots, and syphons, &c., to be fixed for the Scarborough Gas Company.

At the ordinary general meeting of Meters Limited on the 28th inst., the Directors, in submitting the accounts for the year ending the 31st of March, will report that the trading has resulted in a gross profit of £31,577. After providing for interest on the debenture stock, the net profit amounts to £20,328, which, with £2398 brought forward, makes £22,726, out of which interim dividends at the rate of 5½ per cent. per annum upon the preference shares and at the rate of 5 per cent. per annum upon the ordinary shares were paid in November. The Directors now recommend the payment of further dividends at the rates of 5½ and 7 per cent. per annum (making the ordinary dividend 6 per cent. for the year); the addition of £3000 to the reserve fund, making it £55,000; and the carrying forward of the balance of £3184.

It has been decided to carry out a scheme of improved lighting in Tavistock. The lamps will be redistributed and fitted with incandescent burners. The cost of the alterations is estimated at £275; and it is anticipated that the result will be greatly improved lighting at a reduced cost.

On the announcement being made, in connection with the rate estimates, that the Stratford-on-Avon Town Council had taken £1000 as representing the profits of the gas undertaking, Alderman Smallwood said he thought this was scarcely right. There should, he urged, be a reduction in the price of gas, so that the consumers might reap the full benefit.

The Lutterworth Gaslight and Coke Company, Limited, has been registered with a capital of £3800, in 300 shares of £20, £10, and £8 each. It is a re-incorporation, under the Companies Acts, of the Lutterworth Gaslight and Coke Company, originally constituted by Deed of Settlement dated Oct. 30, 1850 (modified by a supplemental deed of April 13, 1898).

At a gas exhibition recently held at Mansfield, Messrs. G. Hands and Co. had a stand on which they showed some very artistic gas-fittings. A novelty was their "Norwich" system of gas lighting, by which gas can be controlled at any distance by means of a tumbler switch, which is fixed on the supply-pipe leading to the fittings. The firm also showed other goods—the inverted incandescent burner being one of the special features. There were pendants of varied design, shades, brackets, &c. They had two rooms—one a drawing-room, the other a bedroom—fitted up to show their novelties in lighting.

LEAFLETS FOR DISTRIBUTION.

"ILLUMINATING TRUTHS FOR HOUSEHOLDERS." Nos. 1, 2, 3, and 4 NOW READY.

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.

Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

WATER-METER REPAIRER. Mid Kent Water Company.
CHARGE OF LIGHTING, COOKING, AND METER INSTALLATIONS. No. 4773.

Situation Wanted.

OUTDOOR DEPARTMENT. No. 4774.

Stocks and Shares.

COMMERCIAL GAS COMPANY. June 4.

TENDERS FOR

Benzol.

WARRINGTON GAS DEPARTMENT. Tenders by June 5.

Coal and Cannel.

BLACKPOOL GAS DEPARTMENT. Tenders by May 26.
CAMBORNE GAS COMPANY. Tenders by June 28.
DONCASTER GAS DEPARTMENT. Tenders by June 13.
DUDLEY GAS COMPANY. Tenders by June 1.
FARNWORTH AND KEARSLEY GAS COMPANY. Tenders by May 28.

Coal and Cannel—*continued.*

GAINSBOROUGH GAS DEPARTMENT. Tenders by May 28.
GLOUCESTER GAS COMPANY. Tenders by May 28.
LOUTH GAS COMPANY. Tenders by May 31.
LURGAN GAS COMPANY. Tenders by June 3.
LEEK GAS DEPARTMENT. Tenders by June 6.
MANSFIELD GAS DEPARTMENT. Tenders by May 28.
MIDDLETON GAS DEPARTMENT. Tenders by June 3.
PAIGNTON GAS COMPANY. Tenders by June 22.
SHREWSBURY GAS COMPANY. Tenders by June 13.
SKIPTON GAS DEPARTMENT. Tenders by May 31.
TAUNTON GAS COMPANY. Tenders by June 1.
TYLDESLEY GAS DEPARTMENT. Tenders by June 3.
WARRINGTON GAS DEPARTMENT. Tenders by June 5.

Fire-Clay Goods.

ABERGAVENNY GAS DEPARTMENT. Tenders by June 8.

Lead, Lead Tubing, and Yarn.

RICKMANSWORTH GAS DEPARTMENT. Tenders by May 29.
TYLDESLEY URBAN DISTRICT COUNCIL. Tenders by June 3.

Lime.

TYLDESLEY URBAN DISTRICT COUNCIL. Tenders by June 3.

Meters.

TYLDESLEY URBAN DISTRICT COUNCIL. Tenders by June 3.

Pipes, &c.

RICKMANSWORTH GAS DEPARTMENT. Tenders by May 29.
TYLDESLEY URBAN DISTRICT COUNCIL. Tenders by June 3.

Retort-Bench and Fittings, &c.

ABERGAVENNY GAS DEPARTMENT. Tenders by June 8.

Tar and Liquor.

ASHBOURNE GAS COMPANY. Tenders by May 31.
DONCASTER GAS DEPARTMENT. Tenders by June 13.
LEEK GAS DEPARTMENT. Tenders by June 6.
MANSFIELD GAS DEPARTMENT. Tenders by May 28.
SKIPTON GAS DEPARTMENT. Tenders by May 31.
STOCKPORT GAS DEPARTMENT. Tenders by May 22.
TYLDESLEY URBAN DISTRICT COUNCIL. Tenders by June 3.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

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O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE,

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
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Telephones: 254 Oldham, and 2412 HOP, London.
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SPENT OXIDE PURCHASED IN ANY DISTRICT.

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General Manager (for England and Wales)—
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BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS

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BY adopting Cripps's Bye-Pass Valves inside your Purifiers, you can relieve the Back-Pressure in the Lower Tiers when the Purifying Material gets hard. They are extremely useful and economical.
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MEADE-KING, ROBINSON, & CO. Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, Leeds. Correspondence invited.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 248 Holborn.

THE TAR (PATENTS) SOLIDIFYING AND DISTILLING CO., LTD., of 15, Mansion House Chambers, London, E.C., GRANT LICENCES to Gas-Works, Collieries, and others to use their process. Particulars of the Secretary.

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MANCHESTER, S.W.
Telegrams: "Enamel." National Telephone 1759.

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SEND for Particulars of the "RAPID" Carburettor. Why be short of Gas when you can stretch the make from 1000 to 2000 cubic feet per ton, without any difficulty?
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CARBURINE FOR GAS ENRICHING.
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For Prices, &c., apply to
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Telegraphic Address: "Carburine, London."

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Brotherton and Co., Ltd., Tar Distillers. Works: Birmingham, Glasgow, Leeds, Liverpool, Wakefield, and Sunderland.

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SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
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NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. Blakeley, Gas Engineer, Thornhill, Dewsbury.

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PREPARED from Pure Iron.
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Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
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4000 INSTALLATIONS IN DAILY USE.
SEE illustrated advertisement in next week's issue.
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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.
with which is amalgamated Wm. Pearce & Sons, Ltd.
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Telephone: 341, Avenue.

GAZINE—A radical Solvent and Preventative of Naphthalene deposits, and the Automatic cleaning of Mains and Services.
It is also used for the Enrichment of Gas, and has an illuminating value double that of 90 per cent. Benzol.
Supplied by C. Bourne, West Moor Chemical Works, Killingworth, or through his Agent, F. J. Nicol, Pilgrim Street Chambers, Newcastle-on-Tyne.
Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

CLAY RETORTS—30 New Retorts, 18 by 15 ○'s and 22 by 14 ○'s. Will accept 3s per foot for immediate Sale. New and Perfect.
Apply to Firth Blakeley Company, Thornhill, Dewsbury.

SITUATION wanted by an Experienced MAN with thorough knowledge of Outdoor Department in all Branches. Excellent References.
Address No. 4774, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Water-Meter Repairer and Fixer for Rural District. Must be a Cyclist.
Apply "Meters," The Mid Kent Water Company, Snodland, Kent.

GAS LIGHTING, COOKING, AND METER INSTALLATIONS.
GENTLEMAN, Experienced, wanted to Take Entire Control of above. Must be familiar with all details, accustomed to Furnishing Accurate Estimates, and Managing Work on minimum cost.
Apply, by letter, giving Age, full Particulars, and Salary Expected, to No. 4773, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

EXCEPTIONAL Bargain. 50 feet Double-Lift GASHOLDER, 60,000 feet capacity. Must be cleared by June. Splendid Bargain. Equal to new. Sacrificed and Re-erected at Nominal Sum for Immediate Sale.
Apply to Firth Blakeley Company, Thornhill, Dewsbury.

BOROUGH OF DONCASTER.

TENDERS FOR COAL.

THE Gas Committee of the Borough of Doncaster are prepared to receive TENDERS for the Supply of 18,000 to 20,000 Tons of best Screened GAS COAL, or GAS NUTS of equal quality, and 1000 Tons more or less) of CANNEL, all as may be selected by the Committee, during the Year ending June 30, 1908.

TENDERS FOR TAR.

They also invite TENDERS for the Purchase of their Surplus TAR, for disposal after the 30th of June next, in accordance with the terms of the Tender Form.
Particulars and Forms may be obtained on application to the undersigned.
Tenders should be sent, under seal, to the Chairman, endorsed "Coal" and "Tar" respectively, not later than Thursday, the 13th of June.
By order of the Gas Committee, who do not bind themselves to accept any Tender.

Robt. Watson,
Engineer and Manager.

Gas-Works, Doncaster,
May 17, 1907.

RICKMANSWORTH URBAN DISTRICT COUNCIL.

CAST-IRON PIPES.

THE Gas Committee invite Tenders for the Supply of about 7570 Yards of 6-inch CAST-IRON PIPES, and about 4470 Yards of 4-inch PIPE (Spigot and Socket), preferably in 12-feet lengths, also SPECIALS and SYPHONS.
Specifications may be had of the undersigned.

LEAD AND YARN.

The Gas Committee also invite TENDERS for the Supply at Rickmansworth Station of about 9 Tons of LEAD of the very best quality of English manufacture, soft and of uniform texture and free from sand cracks and all other defects; and for the Supply of about 9 cwt. of WHITE YARN.
Sealed Tenders, endorsed "Pipes" or "Lead," as the case may be, to be sent to the undersigned on or before the 29th of May, 1907.
The Council do not bind themselves to accept the lowest or any Tender.

H. Lomas,
Clerk to the Council.

May 17, 1907.

TAUNTON GASLIGHT AND COKE COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive TENDERS for the Supply of COAL over One Year commencing the 1st of July next.
Particulars may be obtained from the Secretary, to whom Sealed Tenders should be sent before the 1st of June next.

A. Edwards,
Secretary and Manager.

May 16, 1907.

LURGAN GAS, LIGHT, AND CHEMICAL COMPANY, LIMITED.

THE Directors invite Tenders for the Supply of 3500 Tons of Best Quality Screened GAS COAL, delivered into the Works at Lurgan, or placed on Lighters or on Rail at Belfast.
The Coal must be delivered in such quantities and at such times as the Directors may fix, and the weights as shown on the Company's weighbridge to be accepted by the Contractor. Each Cargo to be accompanied by a Certificate as to place of origin.
Tenders (no Special Form in use), accompanied by reference to Gas-Works using the Coal offer d, should reach me not later than Monday, June 3, 1907, at 10.30 o'clock a.m.
The Directors do not bind themselves to accept the lowest or any Tender.

Fred. W. Magahan,
Secretary.

Gas-Works, May 6, 1907.

MANSFIELD CORPORATION.
(Gas Department.)

TENDERS FOR GAS COAL AND CANNEL.
TENDERS FOR TAR AND AMMONIACAL LIQUOR.

COAL.

THE Gas Committee are prepared to receive TENDERS for 2000 Tons of CANNEL and 11,500 Tons of Best Screened GAS COAL, delivered at Mansfield Station for One Year from the 1st of June, 1907, to the 31st of May, 1908.

TAR AND LIQUOR.

TENDERS for Surplus TAR and LIQUOR made from the 1st of June, 1907, to the 31st of May, 1908. Tenders for Liquor to be made either at a fixed price per Ton or on the Sliding-Scale regulated by the price of Sulphate.
Tenders, endorsed "Coals" or "Tar and Liquor," as the case may be, to be sent to J. Harrop White, Esq., Town Clerk, Mansfield, on or before the 28th of May, 1907.
Particulars and all other Information from the undersigned.
NOTE: No Special Form of Tender provided.
The Committee do not bind themselves to accept the lowest or any Tender.

Arthur Graham,
Engineer and Manager.

Gas-Works, Mansfield,
May 8, 1907.

SKIPTON URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

THE Council invite Tenders for the Supply of about 8000 Tons of best GAS COAL (Screened, Unscreened, and Nuts), to be delivered free at the Railway Station, Skipton, or at the Council's Wharf, adjoining the Gas-Works in Skipton, on the Leeds and Liverpool Canal, between June 30, 1907, and July 1, 1908, in Monthly Quantities.
Full Particulars as to Periods and Quantities of Deliveries, &c., and Form of Tender, may be obtained from the Manager, Mr. J. H. Woodward, Gas-Works, Skipton; and Tenders, endorsed "Tender for Gas Coal," are to be sent to the Chairman of the Gas Committee, Gas-Works, Skipton, on or before Friday, May 31, 1907.

TAR.

The Council also invite TENDERS for the Purchase and Removal of Surplus TAR produced at the Skipton Gas-Works between the 30th of June, 1907, and the 1st of July, 1908.
Further Particulars may be obtained from Mr. J. H. Woodward, Gas-Works, Skipton, to whom Tenders, endorsed "Tar," are to be sent before Friday, the 31st of May, 1907.
The lowest or any Tender not necessarily accepted.

Richard Wilson,
Clerk to the Council.

GLOUCESTER GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the Supply of about 34,000 Tons of GAS COAL for One Year from the 1st day of July next, in such monthly quantities as may be required by the Company.
Tenders to state the Price delivered at the Midland Railway Sidings, Hempsted, near Gloucester, or the Great Western Railway Wharf, Llanthony, Gloucester; or, if sent (as preferred) by Water, the Price f.o.b., and also the Price delivered at the Gas Company's Wharf on the Gloucester and Berkeley Canal.
Further Particulars and Forms of Tender may be obtained of the undersigned.
Sealed Tenders, endorsed "Tender for Coal," specifying the Description and Quality of the Coal, to be addressed to the Chairman, Gas Offices, Eastgate Street, Gloucester, and delivered not later than Tuesday, the 28th day of May inst.
The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender.

By order,
William E. Vinson,
Secretary.

Gas Offices, Gloucester,
May 6, 1907.